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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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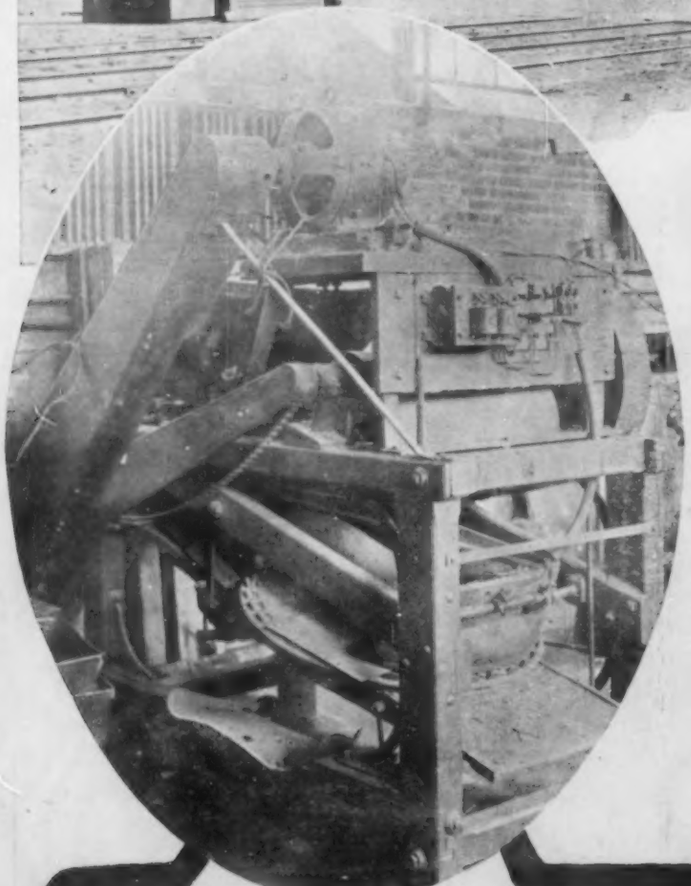

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THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER AND ELECTRO-PLATERS REVIEW

Vol. 18 NEW YORK, AUGUST, 1920 No. 8

New Standards for Metals

Reports on Composition and Nomenclature of Non-Ferrous Alloys at the 1920 Meeting of the American Society for Testing Materials at Asbury Park, N. J.

Important recommendations were made by Committee B-2 on non-ferrous metals and its sub-committees. Among these reports was one from W. R. Webster, Bridgeport Brass Company, chairman of a sub-committee on wrought metals, which presented tentative specifications for sheet high brass.

SHEET HIGH BRASS

These specifications are for commercial sheet brass used for drawing, forming, stamping and bending. "Since high brass is used for many purposes where the requirements of the operations used are too particular to be specified by any of the ordinary physical tests, it is frequently advisable to submit samples or drawings to the manufacturer and secure an adjustment of annealed or temper to suit the actual operations to which the material is to be submitted."

The chemical composition is: Copper, 64.5 to 67.5 per cent; lead, not over 0.30 per cent; iron, not over 0.05 per cent; zinc, remainder; other impurities, not over 0.10 per cent. Physical properties and tests are:

Hard Brass.—The average Brinell hardness of ten samples of cold-rolled brass 0.080 in. or over in thickness shall be within the limits in the table and the average of tension tests of two samples of cold-rolled brass thinner than 0.080 in. shall conform to the minimum requirements there shown.

	Hardness No.	Tensile Strength, lb. per sq. in.	Elongation in 2 in., per cent
Quarter hard...	75-95	45,000	27.5
Half hard.....	95-115	52,500	15.0
Hard	130-150	67,500	5.0
Extra hard.....	150-170	80,000	2.0
Spring	160-180	87,500	1.0

Soft Brass.—The average Brinell hardness of ten samples of annealed brass 0.080 in. or over in thickness shall be as given in the table, and the average of tension tests of two samples of annealed brass thinner than 0.080 in. shall conform to the minimum requirements there shown:

	Hardness No.	Tensile Strength, lb. per sq. in.	Elongation in 2 in., per cent
Light anneal...	65-75	45,000	32.0
Drawing anneal.	55-65	42,000	38.0
Soft drawing anneal	47-55	40,000	42.0

ALUMINUM FOR IRON AND STEEL

The sub-committee on aluminum and aluminum alloys, Jesse L. Jones, Westinghouse Electric & Manufacturing Company, Pittsburgh, chairman, presented tentative specifications for aluminum for use in the manufacture of iron and steel. They include two grades of virgin and four grades of secondary aluminum.

Prof. William Campbell, Columbia University, chairman of committee B-2, reported a revision of the tentative specifications for alumium ingots for remelting and for rolling. Three grades are proposed containing a minimum of 99.5, 99.0 and 98 per cent aluminum. The new grade 99.5 per cent was added to satisfy the requirements of the Bureau of Aircraft Production and the manufacturer of electrical apparatus.

NOMENCLATURE OF METAL ALLOYS

Brass.

1. The term **Yellow Brass** shall be used for Zinc-Copper alloys only, containing from 63 to 80 per cent copper and having a yellow or brass color.

Example: **Composition of Alloy:** Zinc, 30 per cent; Copper, 70 per cent,
Systematic Name: Zinc-Copper.

2. The term **Red Brass** shall be used for Zinc-Copper Alloys only, containing more than 80 per cent copper, in which the color varies from a golden to a copper red.

Example: **Composition of Alloy:** Zinc, 15 per cent; Copper, 85 per cent.
Systematic Name: Zinc-Copper.

3. The term **Yellow Red Brass** shall be used for Zinc-Copper alloys only, containing from 55 to 63 per cent copper, in which range the Brass has a yellowish red color.

Example: **Composition of Alloy:** Zinc, 40 per cent; Copper, 60 per cent.
Systematic Name: Zinc-Copper.

4. **Lead Brass.**—Brass containing more than 0.50 per cent of lead shall be known as Lead Yellow, Red or Yellow-Red Brass, according to the percentage of Copper it contains.

Example: Lead-Yellow Brass.
Composition of Alloy: Lead, 1 per cent; Zinc, 33 per cent; Copper, 66 per cent.
Systematic Name: Lead-Zinc-Copper.

5. **Tin Brass.**—Brass containing more than 0.25 per cent Tin shall be known as Tin Yellow, Red or Yellow-Red Brass, according to the percentage of Copper it contains.

Example: Tin-Yellow Brass.
Composition of Alloy: Tin 0.50 per cent; Zinc, 39.50 per cent; Copper, 60 per cent.
Systematic Name: Tin-Zinc-Copper.

6. In cases where other metals are added, these shall be designated by the use of the proper prefix or prefixes:

Example: Manganese-Tin-Brass.
Composition of Alloy: Manganese, 0.50 per cent; Tin, 1 per cent; Zinc, 38.50 per cent; Copper, 60 per cent.
Systematic Name: Manganese-Tin-Zinc-Copper.

7. The term **Bronze** shall be used for Tin-Copper Alloys only, containing over 50 per cent Copper. In cases where other metals are added these shall be designated by the proper prefix or prefixes:

Example: Aluminum-Bronze.
Composition of Alloy: Aluminum, 3 per cent; Tin, 5 per cent; Copper, 92 per cent;
Systematic Name: Aluminum-Tin-Copper.

8. The term **Cupro-Nickel** shall be used for Nickel-Copper Alloys in which Copper predominates. In cases where other metals are added these shall be designated by the proper prefix or prefixes:

Example: Iron-Manganese-Cupro-Nickel.
Composition of Alloy: Iron, 1.5 per cent; Manganese, 2 per cent; Copper, 67 per cent; Nickel, 29.5 per cent.
Systematic Name: Iron-Manganese-Nickel-Copper.

9. The term **Nickelene** shall be used for Nickel-Zinc-Copper Alloys only. In cases where other metals are added these shall be designated by the proper prefix or prefixes:

Example: Lead-Nickelene.
Composition of Alloy: Lead, 1 per cent; Nickel, 5 per cent; Zinc, 31.50 per cent; Copper, 62.50 per cent.
Systematic Name: Lead-Nickel-Zinc-Copper.

The committee E-4 on magnification scales for micrographs will hereafter be known as the committee on metallography. It is forming a sub-committee on "Preparation of Metallographic Specimens" with Prof. William Campbell as chairman, and will cooperate with other committees of the society interested in metallographic problems. The committee recommended the forming of a standing committee on pyrometry.

The members of Committee B-2 who were responsible for the work done are as follows: Dr. William Campbell, Columbia University, chairman; W. H. Bassett, American Brass Company; W. A. Cowan, National Lead Company; G. H. Clamer, Ajax Metal Company; W. M. Corse, Monel Metal Products Company; P. D. Merica, International Nickel Company, and W. R. Webster, Bridgeport Brass Company, vice chairmen; Messrs. Jones, Blough, T. J. Johnson, Pannell and Brile, members.

COPPER TUBES FOR PNEUMATIC TUBE SYSTEM

The Western Union Telegraph Company is spending $250,000 on a pneumatic tube system in San Francisco, connecting seventeen branch offices with the main operating room of the company, on the fifth floor of the Bankers' Investment Building at 722 Market Street. Eleven miles of tubing of pure copper is used to resist electrolysis and chemical action and because it presents an ever-smooth surface to the carriers. The tubing used is in fifteen foot sections. Triple expansion joints are used for the purpose of completely preventing the loss of pressure. Each of the tubes is closely fitted in a creosoted wood duct. There are 24 trunk tubes entering the main office, from Market Street.

In the accompanying photograph, the end of one of the tubes can be seen at B, and the creosoted duct can be seen at A. This trench carries two tubes, and leads to one of the branch offices.

COPPER TUBES IN TRENCH.

The tube system is so arranged as to accommodate additional branch offices, which will be connected with the main office in the future.

OLD GLORY IN METAL

Torn and discolored in battle, a nation's flag commends respect and reverence; associations dignify its mutilation. A flag which has become soiled and torn through use or neglect in ordinary service, which hangs rope-like or wraps disspiritedly about the flag staff, is not an inspiration. A Boone, Ia., gentleman has invented a flag which is much more enduring than the ordinary kind. It is constructed of porous copper wire cloth, reinforced by wire braces and iron pipe stays, an arrangement which gives the most desirable visual effects with the additional advantage of economy and constant, attractive display. This kind of a flag always appears bright and fresh, never drooping, tearing, or wrapping around the staff. Such a flag is not stiff in appearance, but swings freely, and gives the eye the pleasinging impression of silk fabric in motion.

COPPER FLAG.

Such a flag serves as a weather vane as well as an emblem. Its light, porous construction reduces wind pressure so that there is no excessive strain on staff or building. They save their owners the expense of frequent replacement, and the annoyance of raising and lowering to suit the weather. Where there is considerable smoke in the air, it may be necessary to freshen their appearance occasionally with a light coat of paint.

Marine Brass Goods and Fittings

A Brief Description of the Characteristics of Marine Fixtures as Distinguished From Standard Lines

Written for The Metal Industry by PETER W. BLAIR, Mechanical Editor

The United States has already become a formidable maritime factor, so formidable in fact as to stimulate competition. Her record, made in the past three years in the building of ships of all styles and types, has been marvelous. Mistakes we know have been made, but the business is now on a sound basis and construction is proceeding all over the continent. Owing to the large amount of brass and copper products that are used in the construction of steamships a great field is opened for the brass manufacturer.

When the United States first went into the shipbuilding program and yards were springing up all over the country, drawings and specifications were submitted to the different brass manufacturers throughout the country for quotations on castings and finished products on bronze marine specialties. They were simply amazed at the requirements of the following inspecting bureaus:

United Steam Boat Inspection Services.
Lloyds.
Bureau Veritas.
Canadian Steam Boat Inspection Services.

Also the working pressures the goods had to stand and pass inspection; also the different composition or alloys such as G (Gun metal), H (Bearing metal), MN (Manganese bronze), M (Steam metal).

Numbers of the manufacturers could not see why they could not substitute the standard valves and fittings that they had been producing and marketing for years, for general use, in ships in place of the heavy castings and different designs that were demanded. When they submitted their samples the trained marine engineers that were on the different Shipping Boards soon convinced them their goods were impractical for marine work and the only alternative they had was to start from the beginning and make new patterns and install equipment for the production of the goods as per specifications.

FIG. 1. SHIPMENT OF BRONZE CASTINGS FROM CRAMP'S BRASS FOUNDRY, PHILADELPHIA, PA.

Fig. 1 shows a daily shipment of bronze marine castings from Cramp's Brass Foundry to one customer. The Cramp's Brass Foundry has a daily output of 1,000,000 lbs. of bronze castings, which are used for vessels by themselves and for other shipyards. The two other leading shipyards, which are controlled by the Bethlehem Steel Corporation, are located at Fore-River, Quincy, Mass., and San Francisco. They are built on the most approved lines and have the most modern equipment.

Fig. 2 shows U. S. N. steam pressure, 125 lbs. brass gate valves, screwed ends. From the design of these two gate valves they resemble the standard grade of gate valves in general use, with a few minor changes. One of the features is an indicating attachment which shows the amount of opening or passage way.

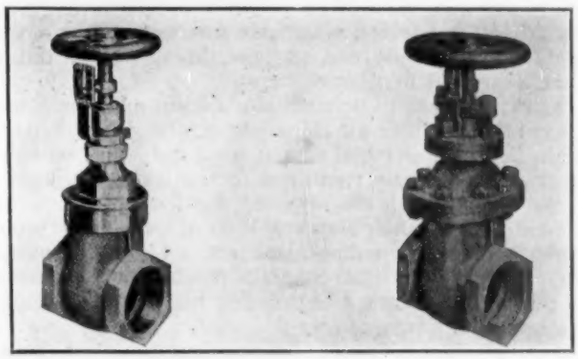

FIG. 2. U. S. N. BRASS GATE VALVES.

Fig. 3 shows bronze boiler valves. These valves are built for 300 lbs. working steam pressure and are tested at 600 lbs. hydraulic pressure. They are differently constructed and designed from the valves used in stationary engine rooms, as they are especially designed for severe service under steam pressure of 250 lbs. where the total temperature does not exceed 500 degrees. They are also made of hard bronze (copper and tin), so proportioned as to resist the action of super heat to a total temperature of 700 degrees when the pressure does not exceed 250 lbs. These valves are also suitable for higher pressure, up to 350 lbs. when used with saturated steam or for heavier work.

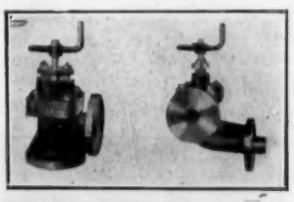

FIG 3. BRONZE BOILER VALVES.

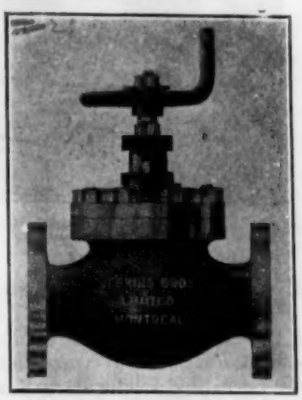

FIG. 4. BRONZE BOILER VALVE.

The main features in marine castings and valves are the specifications of mixtures or alloys. The one that enters into the specifications for Gate and Globe valves is the Admiralty or U. S. Naval Mixture, 88 per cent copper, 10 per cent tin and 2 per cent zinc; also with a clause specifying that the alloy shall not contain over 1 per cent lead. This alloy is too refractory to be worked with customary tools, and the low lead content makes it very hard, so the manufacturer who has been making his valves from an alloy 85-5-5-5 has a different proposition on his hands. By the use of cutting compounds it is possible to reduce the friction and keep his tools

cool. The superiority of this alloy for valves is demonstrated by the sound castings that are produced.

Another problem is the furnishing of all valves with manganese bronze, rolled brass or cast spindles or stems. This is where the manufacturers could not see how the benefit was to be derived from the use of this metal and put up the argument that it spoiled the appearance of the valves to depart from the use of the red brass spindle or stem. The superior qualities of manganese bronze spindles or stems have since been demonstrated by their high tensile strength and excellent working and wearing.

The leading manufacturers of valves have now adopted Manganese Bronze spindles for use on almost all globe and gate valves as it is one of the parts that is subjected to the heaviest wear and tear that valves have to stand in their daily use, and the thread part is the one that wears out first.

Great care has to be maintained when machining manganese bronze that all chips are carefully kept separate from the regular metal that is used on bodies of valves as it will completely ruin them for remelting purposes.

So very careful are some of the manufacturers that they are having their complete lines of manganese bronze globe and gate spindles manufactured entirely outside their plant, as there are concerns now making a specialty of this class of work and handling nothing but manganese bronze castings.

Fig. 5 shows bronze boiler-asbestos-packed boiler-water gauges. By comparing these illustrations with the regular goods on the market their massive form is clearly visible. Fig. 5 shows test or salinometer cocks, asbestos packed. These cocks are a distinct departure from the ground key cylinder cocks as they are asbestos packed, top and bottom and specially grooved in the barrel of the body for asbestos packing which makes their operation smooth under heavy pressure of live steam.

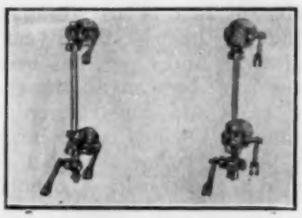

FIG. 5. BOILER-WATER GAUGES.

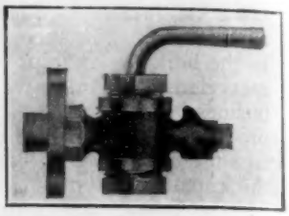

FIG. 6. TEST OR SALINOMETER COCKS.

The U. S. Steamboat Inspection Service requires that all fittings and valves 3 inches and larger shall be subjected to a Hydrostatic Test of 3½ times the pressure to which they shall be subjected in service. The U. S. Navy requires that fittings for working pressures not exceeding 120 lbs. steam with a temperature of 350 or of cold water not exceeding 175 lbs. shall be subjected to a hydrostatic test of 350 lbs. for over one minute.

Forms for Cores Made of Plaster Paris

Written for The Metal Industry by JOSEPH McGINNIS, Granular Metal Company, Roxbury, Mass.

We received an order a short time ago for some castings to be made from the patterns shown in Fig. 1 and Fig. 2. The castings made from these patterns are shown in Fig. 5 and Fig. 6. The casting shown in Fig. 5 is a vaporizer and was made of aluminum. The one shown in Fig. 6 is called a bend and is used to connect the vaporizer to an internal combustion engine. It was made of bronze.

As the cores were quite crooked and there were a number to make, it was thought best to have forms to dry them on and we decided to make them of plaster of paris. They were a success.

Fig. 3 shows one-half of core box for vaporizer and core on form. (The small cores shown on top of core box are jacket cores that partly surround core shown on form.) Fig. 4 shows one-half of core box for bend and core on form.

FIG. 3. HALF OF CORE-BOX FOR VAPORIZER.

FIG. 4. HALF OF CORE-BOX FOR BEND.

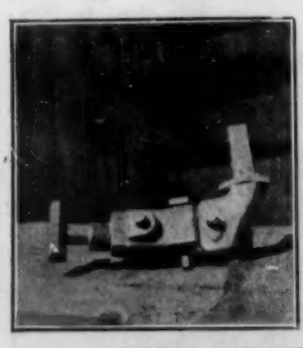

FIG. 1. SPECIAL PATTERN VAPORIZER.

FIG. 2. SPECIAL PATTERN BEND.

To make a form we filled the cavity in the core box with molding sand rammed hard. The sand was then scraped off even with joint of core box. The core box was then placed on a bottom board, and molding sand formed along sides and ends. Rods to hold the plaster were placed in position and the plaster of paris, which had been mixed with water, poured in.

Forms made this way will break up after a time, but I am of the opinion that if a flask was made to fit the core box and the plaster poured into it they would last a long time and could be renewed very quickly and cheaply.

FIG. 5. CASTING FROM PATTERN IN FIG. 1.

FIG. 6. CASTING FROM PATTERN IN FIG. 2.

A Note on Stresses Caused by Cold Rolling

A paper read at the Twenty-third Annual Meeting of the American Society for Testing Materials,[1] at Asbury Park, N. J., June 22-25, 1920

By HENRY M. HOWE and EDWARD C. GROESBECK

Although this paper deals with the rolling of steel strips, the findings are directly applicable to brass and copper, as it relates essentially to the practice of rolling.—Ed.

Professor A. E. White[2] held that a given total reduction of the thickness of brass condenser tubes was given better by many light drafts than by a few heavy ones, an opinion as to which so competent an observer as Mr. W. R. Webster expressed doubt. Later experiments by Mr. Webster[3] were inconclusive.

In studying the effect of variations in the degree of reduction per pass, we should know, among other things, how they affect the intensity of the stresses set up in the metal by the rolling. To that end we have made the experiments here described. As a matter of convenience we operated on strips of soft sheet steel, both because this is a more important material than brass, and because we believe that what is true of one is true qualitatively of the other, and indeed of most metallic masses which resemble them generally in their mechanical properties.

EXPERIMENTAL PROCEDURE

We rolled cold a series of pairs of strips of low-carbon sheet steel as sketched in Figs. 1 and 2, reducing the several strips from their initial thickness of 0.035 to 0.029 in., using in some cases six heavy reductions or passes, in others ten passes of intermediate severity, and in still others, thirty-one light passes. We inferred the relative intensity of the residual stresses from the sharpness of the curvature thus induced in the strips, as shown in Fig. 2. Further details of procedure are as follows:

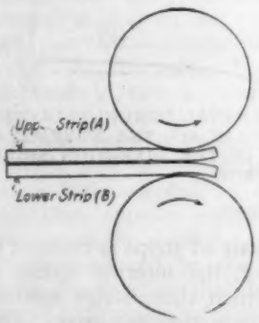

FIG. 1.—STRIPS ENTERING THE INITIAL PASS.

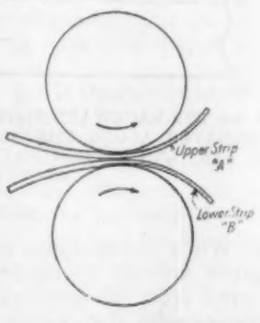

FIG. 2.—A LATER PASS.

Figs. 1 and 2.—Sketches showing how the spring or arching is caused in two superposed strips by the residual stress caused by cold rolling. The thickness of the strips is exaggerated for clearness of illustration.

The material consisted of common cold-rolled soft sheet steel 0.036 in. in thickness. All the strips were cut from a single sheet. Each of them was 3 in. long and 0.5 in. wide. All were ground to size along the edges to remove any part that was affected by cutting them from the sheet. They were next annealed at 690-740° C. for 2 hours, and were then ground down to a thickness of 0.035 in.

The rolls were 2 in. in diameter and 3 in. long.

The Curvature.—The strips were rolled in pairs, one strip being superposed on the other as in Figs. 1 and 2, and the resultant curvature was determined after each pass both by measuring the "rise" or arching of each strip, and also by measuring the total distance between the two members of each pair at their greatest distance apart, *d*, when set together as in Fig. 3.

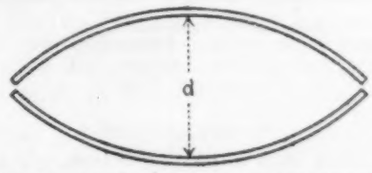

FIG. 3.—SKETCH SHOWING METHOD OF MEASURING THE COMBINED SPRING OF THE TWO MEMBERS OF EACH PAIR OF STRIPS. (SEE FIG. 4.)

The width of the strips did not change measurably in any case throughout the whole course of the rolling.

The elongation of the strips as measured along their convex faces was found to be directly proportional to the reduction, independent of the number of passes by which it was brought about.

The total number of strips represented by these results was twelve for the heavy, six for the intermediate, and fourteen for the light reductions.

THE RESULTS

As shown in Figs. 4 and 5, the spring caused by a given total reduction increases with the amount of reduction per pass.. The concordance in these first crude experiments we believe suffices to establish the principle, but more elaborate experiments would be needed to determine the quantitative relations between the effects of light and heavy reductions. In particular, the length of the strips used in the experiments, 3 in., was too small to enable us to enter them always strictly normally to the vertical plane passing through the axis of the rolls, and hence there was a tendency for the strips to roll diamondwise. This tendency was met by entering the strips slightly obliquely in the following pass.

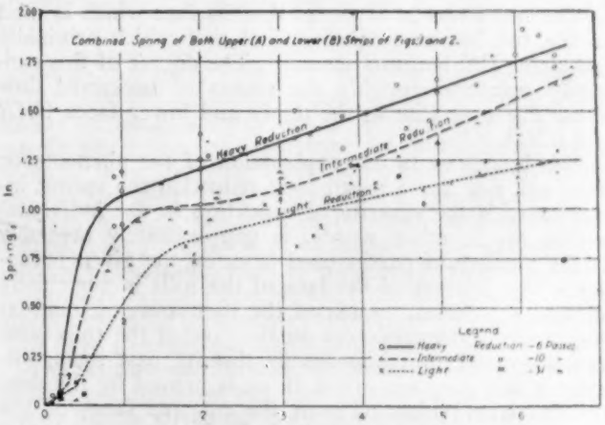

FIG. 4.—INCREASE IN COMBINED SPRING PRODUCED BY SUCCESSIVE PASSES IN BOTH STRIPS OF EACH PAIR OF SUPERPOSED STRIPS.

[1] Published by permission of the Director of the Bureau of Standards.

[2] A. E. White, "An Investigation Leading to Specifications for Brass Condenser Tubes," proceedings, Am. Soc. Test. Mats., Vol. XVI, Part II, p. 151 (1916).

[3] W. R. Webster, "Light versus Heavy Reduction in Cold Working Brass," Proceedings, Am. Soc. Test. Mats., Vol. XVII, Part II, p. 157 (1917).

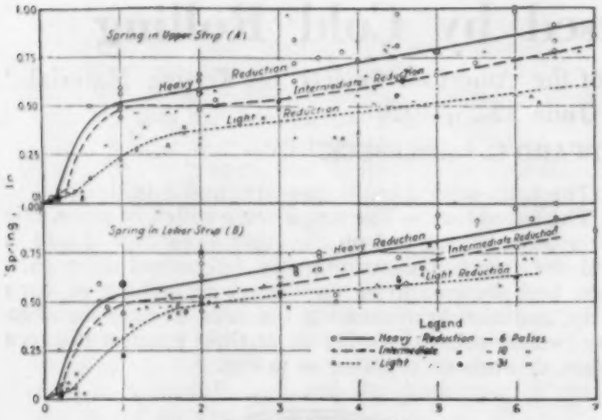

FIG. 5.—INCREASE IN SPRING PRODUCED BY SUCCESSIVE PASSES IN THE INDIVIDUAL STRIPS OF EACH PAIR OF SUPERPOSED STRIPS.

THE EXPLANATION

Flow of Metal Due to Skin Friction.—We refer the greater stress caused by the heavier reductions to the greater skin friction produced between the strips and the rolls.

To refresh our memory as to what occurs in rolling, let us suppose that a solid bar *OABDHE*, Fig. 6, enters the rolls so that its face *CG* reaches the plane of their axes, and that its segments *ABC* and *HDG* are squeezed away from the original position by the pressure, with the result that the upper surface of the piece takes the shape *OKC* and the lower surface the shape *ELG*. What becomes of this metal initially in *ABC* and *HDG*? It flows away from the pressure of the rolls. The vertical component of the flow from each roll is in great part neutralized by the resistance of the other roll, so that most of the flow follows the horizontal component, and that the metal flows backwards. For simplicity, the slight bulging up and down at *K* and *L* may here be ignored.

The friction of the faces of the rolls impedes the backward flow of the metal in immediate contact with them, with the result that the rate of backward flow increases from the upper and lower surfaces of the piece *AB* and *HD* towards its axis *PN*. In a solid bar thus rolled, this progressive difference in the degree of backward flow from surface to axis results in residual stress. But if we suppose that this solid bar *OBDE* is slit in two along *PN* so as give the conditions of our experiments, this same progressive difference causes each of the two strips to bend, so that its face which is next to the roll becomes concave, and that which originally lay along *PN* becomes convex. The degree of this convexity measures roughly the excess of backward flow along *PN* over that at the upper and lower faces *OAB* and *EHD*.

This brings us to our explanation of the phenomenon observed, that for a given total reduction the spring increases with the severity of reduction in the individual passes, or, in other words, is approximately inversely as the number of passes used to cause the given reduction. The friction of the face of the rolls is due chiefly to their roughness. Each of the thousands of immeasurably small protuberances on the face of the rolls bites into the metal, and impedes its flowing past them, impedes it but does not arrest it, as is proved by the progressive lengthening of even the concave faces of the strips. Clearly the greater the reduction in a given pass, the greater is this frictional impediment to the backward flow at the surface; hence the greater is the ratio of the axial to the surface flow; hence the greater the internal stress in a solid bar thus rolled, and the greater the convexity induced in a pair of strips as rolled in these experiments. The explanation thus resides wholly in the increase of the ratio of axial to surface flow caused by increase of surface friction due to increased reduction per pass.

The Progressive Flattening of the Curves of Figs. 4 and 5.—This flattening represents a progressive lessening of the increment of curvature caused in successive passes by the friction of the rolls. A tentative explanation is that, as the strip grows progressively stiffer because of the plastic deformation, it offers progressively greater resistance to the tendency of the friction of the rolls to increase its curvature.

Confirmatory Evidence.—Mr. E. H. Peirce[4] of the American Steel and Wire Co. finds that a greater total reduction can be endured without rupture in wire-drawing with a larger number of light drafts than with a smaller number of heavy ones. Moreover, the tensile strength, the ductility as indicated by the various toughness tests, and the elastic limit as indicated by the ability of the wire when in helical springs to endure compression without taking permanent set, are greater for a given total reduction when this is caused by a larger number of light drafts. Since internal stress tends to lessen all three of these properties, these observations are in harmony with ours.

Extrapolation of Results.—It may be assumed provisionally that what is true of cold-rolling is true also of drawing through a die, because the action of the rolls approximates that of a rolling die, the grip which draws the metal forward being given by the surface friction of the rolls instead of by a clutch as in wire, spring, and tube drawing.

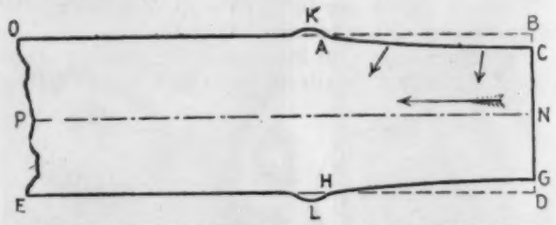

FIG. 6.—THE BACKWARD FLOW OF METAL DURING REDUCTION IS GREATER ALONG THE AXIS THAN ON THE SURFACE OF THE BAR, AND APPROXIMATELY IN THE DIRECTION SHOWN BY THE ARROWS.

SUMMARY

1. When the thickness of a pair of strips is reduced by a given amount by cold-rolling, the internal stress, as inferred from the convexity which these strips assume, increases with the amount of reduction per pass. This is ascribed to the skin friction of the rolls.

2. As the rolling progresses the rate of deflection decreases, perhaps because the progressive increase of the stiffness of the strips enables them to resist better the bending effect of the skin friction.

3. The elongation is proportional to the reduction and independent of the number of passes.

Bluing Small Articles

A good method to employ in bluing small steel articles is to place them in an iron pan containing a quantity of clean, dry sand over a bright fire. Move the pieces around constantly until the desired color is obtained; then remove and plunge into a clean oil. The article to be colored must be thoroughly clean before employing this method.—P. B.

[4] Private communication, March 20, 1919.

Molybdenum and Its Applications

A Summary of the Present Knowledge and Recent Developments

Written for The Metal Industry by R. E. SEARCH

Although molybdenum has long been known to chemists and mineralogists, its industrial applications are recent.

The word molybdaena is met with in Pliny the Younger, and in Discorides, but they appear to have applied it to lead and its alteration products; in addition this term and that of plumbago used to be employed indifferently to mean the same substance.

Scheele, in 1778, confirming the earlier experience of Quist, showed that molybdenite was a special sort of mineral, that gave by roasting or treatment with nitric acid, a substance resembling tungstic acid, but whiter and capable of sublimation. In 1779, Pelletier showed that molybdenite contained sulphur; finally in 1780 Hjelm succeeded in reducing molybdic acid and in obtaining a metal regulus.

THE MOLYBDENITE MINERALS

The principal one is molybdenite. It is sulphide, MoS_2, containing about 60% Mo. and 40% S. It is found in scales or foliations, wonderfully resembling graphite, although of a lighter gray and more bluish than graphite. The best way to distinguish one mineral from the other is to observe the streak which their impress leaves on a sheet of paper, or better still upon a porcelain plate. The molybdenum streak is altogether greener than that left by graphite. The crystals of molybdenite measure up to 15 c. m. in length by 9 c. m. thick. Density 4.5 to 4.8. Hardness ,1.5. Infusible by the blowpipe; color in the flame green, it yields an infusible gray powder. The following special reaction for the detection of Molybdenum by the blowpipe, may be of interest: small quantities of molybdic acid may be readily detected as follows: a little of the powdered substance is added to some concentrated sulphuric acid on a tray-shaped piece of platinum foil; after heating until brisk evaporation of fumes sets in, then cooling, the foil is repeatedly breathed upon. Where only blue spots appear on cooling an intense blue color is produced by breathing. The reaction succeeds still better if, instead of breathing upon the foil, a little alcohol be added; the characteristic blue color then appears either at once or immediately after burning off the alcohol. (Von Kobell.) This blue oxide is also produced by the iodine sulphide reaction. To obtain this reaction the assay is mixed with an equal volume of iodine sulphide, placed near one end of a gypsum slab and heated in the Oxidizing flame. The incrustations have a deep ultramarine blue, close to the assay. (The film is an oxide, Mo_2O_5.) This test is very characteristic.

ASSAY OF THE MINERAL

In order to oxidize the mineral it is sufficient to heat a fragment in a porcelain crucible with a drop of H_2SO_4 up to the cessation of white fumes; after cooling, the fragment is covered with a coating of a dark blue color, but it is somewhat fugitive.

In the case of an assay of molybdenum this operation should be preceded, either by a nitric oxidation followed by evaporation to dryness, or by a roasting in the air.

One may also make an assay according to the method proposed by Dr. Moir, which gives a permanent blue; it consists of having a solution which contains a trace of alkaline molybdate, acidified by acetic acid, then add a sulphate of hydrazine. The blue coloration which develops persists even when the assay is boiled.

Finally, the following reaction is indicated as being very sensitive; it consists of treating an acid solution of the mineral by a sulphocyanide of zinc to which is added a fragment of zinc. It then develops a crimson color. The presence of iron does not interfere, because the red coloration of a kindred nature produced by that element disappears as soon as the zinc is added.

METALLIC STATE

In the laboratory one obtains molybdenum by beginning with the molybdenite which is roasted in the air; afterwards it is reduced to the form of a red oxide by employing as a reducing agent either hydrogen or charcoal. The oxide, however, may be replaced by the chloride.

Industrially either the aluminothermic reaction is employed which gives the metal free from carbon, but it contains a little silicon, and 1 to 2% iron; or, a reduction by carbon in the electric furnace. The metal thus prepared contains up to 7% carbon of which 1% is graphite and 6% carbon is combined. For this treatment the volatility of the molybdic acid requires certain precautions. The operation can be carried out with a tubular furnace. Moissan proceeded to obtain the gray oxide by calcining ammonium molybdate, this oxide is but slightly volatile. The mixture of oxide with carbon was heated for six minutes with a current of 800 amperes at 60 volts.

PROPERTIES

Molybdenum such as that obtained by Moissan is brittle and hard enough to scratch glass. It takes a temper and may be rendered less hard on the surface by heating in contact with its own oxide. This property has found an application in a process of making lamp filaments for incandescent electric lamps.

When pure, molybdenum is silvery white and its density is greater than 9, (one authority says 8.8). It is as malleable as iron and does not scratch glass; it may be filed, polished and like iron it is forgeable when hot. It rusts but a little at ordinary temperatures; it is superficially altered at dull red heat and oxidizes rapidly at 600°C. Its melting point (2500°C.) is greater than that of Platinum (1755°C.) and lower than that of Tungsten (2800°C.) In general molybdenum is attacked by oxidizing agents. It resists the action of HCl, HF. and H_2SO_4.

OTHER APPLICATIONS

Molybdenum has been proposed for the construction of filaments for incandescent lamps, and the luminous intensity of this filament is very great; it is equal to that of the tungsten filament; moreover the metal being easier to work than the latter. Molybdenum and tungsten alloy well together. The two metals in the form of powder are mixed, then compressed into rods which are heated in an atmosphere of hydrogen. The analysis and micrographic examination of these alloys show that there is complete isomorphism between the two metals. These alloys have been proposed as substitutes for platinum but they have a certain oxidability and cannot be soldered.

The resistance to chemical reagents increases if, during fabrication, the alloy has been submitted to a high pressure. Finally a coating of a precious metal gives good results.

This alloy may serve for dental work, in making the break for ignition in motors with internal combustion, and with the establishment of receivers resistant to the

action of the alloying metals cast, even at high temperatures. An alloy of iron with 10% chromium and with 2 to 5% molybdenum is very resistant to acids. Stellite is an alloy of nickel, cobalt and molybdenum. It is employed in the manufacture of cutting tools for cutting at high speeds. It is also used for fine cutlery, because it is very resistant to the tarnishing action of the air, and to the attack by fruit acids. Neverthless, on account of their being cast, and because they cannot be forged, the pieces made of stellite have to be finished on a grindstone.

Among the applications of molybdenum compounds the following are referred to:

The employment of ammonium molybdate in chemical analysis; of phosphomolybdic acid in pharmaceutical preparations and in the recuperation of certain alkaloids (Cocaine, quinine, etc.)

Certain salts of molybdenum are sensitive to light, or act chemically under the influence of light upon certain organic compounds more or less complex. This photochemic property is utilized in the industry of printing in blue upon textile fabrics.

Certain molybdic compounds added to uranium are at the time sensitive to light and radioactive.

Many of the arts or industries employ some molybdenum: for the coloration of leather and in india rubber, dyeing of silk and delaine, the preparation of fine colors for pottery, incombustible materials, disinfectants for cloth for hangings in wagons and railway carriages.

It is likely that molybdenum is less rare than it is now believed to be, and that increased demands would lead to the discovery of new deposits.

It has been stated that it is a metal which does not alloy with copper in any proportions, and for that reason it has been suggested that it may be used as a shoe, in the form of a tube closed at one end, to protect thermocouples from injury, when plunged into molten alloys that contain copper as its principal constituent.

Finally the necessity for molybdenum has been admitted. Some facts made known by the war indicate an increased demand for its use in the hardening of steels. It is expected, moreover, that this necessity will not diminish in times of peace, for the great works now being undertaken will require more hardened steel products than have ever before been necessary.

The more recent references to the literature of the subject are appended:

Molybdenum, Australian Chem. & Met., June, 1918. Queensland Gov't Min. Jour. Aug. 15, 1918. Trans. Royal Canadian Inst. Nov. 1918, Vol. 11 p. 269-89. Chem. & Met. Eng. Oct. 25, 1918, Vol. 19, p. 654-5. Iron and Steel of Canada, Feb. 1919, Vol. 2, p. 2-3.

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Developments in Uses of Molybdenum in Alloy Steels. Iron Age, Jan. 22, 1920, also W. E. Simpson in Min. & Sci. Press, Dec. 20, 1919.

M. Bellart, Le Molybdene et ses applications, in Revue d'Electrochimie et d'Electrometallurgie. Sept-Oct., 1919, p. 142-146.

Chem. and Met. Eng. April 15, 1919, p. 436.

MOLDING SANDS

A founder was having a little trouble with metal composed of 79 per cent Copper, 12 per cent Tin, 8 per cent Lead, 1 per cent Phosphorus. This metal is for crane bearings and he was making them in Albany sand. He had rammed them all kinds of ways and could not get any better results. The castings are scabbed and swollen all over.

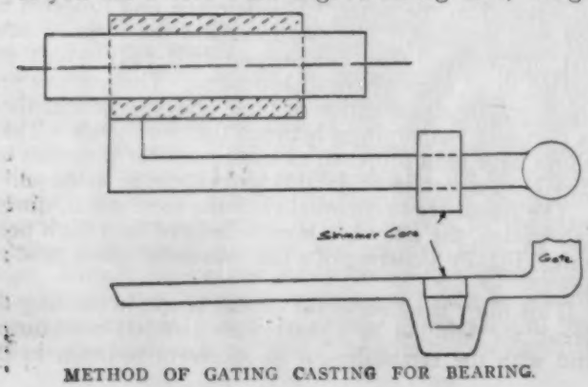
He was advised as follows:

Make a facing sand composed of 8 parts of molding sand, 1 part of Pitch Binder (such as is used for Core Binder); the molding sand should be No. 2 Albany, however, if it is a finer grade, use 1 part Sharp sand. This mixture would be:

7 parts molding sand
1 part sharp sand
1 part binder sand

Mix together with a shovel, then riddle through a No. 10 riddle, temper with water to a consistency that will hold when squeezed in the hand, rather have it on the dry side. Sand and gate as per sketch attached.

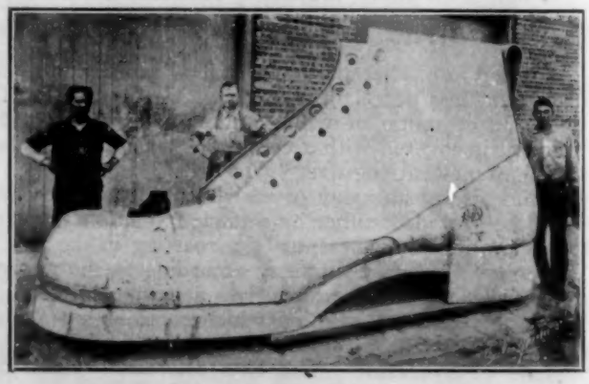
If you use a core make a good strong core, using a little oil and take a good grade of black lead and wet down with carbon oil and rub the lead well into the core and let the core stand for a short time and pour your metal at approximately 1,900 deg. Fahr. A simple way is to add gates to your pot of metal until the metal will not melt them readily, that is the pouring temperature for this class of metal. Follow these instructions and you cannot make bad castings.—W. J. R.



METHOD OF GATING CASTING FOR BEARING.

JUMBO METAL SHOE

This mammoth galvanized iron shoe was made by a firm in Peoria, Ill., for advertising purposes for a large shoe manufacturing plant. It weighs about 500 pounds. It stands 7½ feet high, is 14 feet 5 inches long, and the sole is 4 feet 8 inches wide. The small shoe from which this sheet-metal shoe is made is shown on the top of the large shoe. The large shoe is perfect in every detail and is quite a feat of manufacturing. The use of models of boots and shoes as shop signs was once universal, when the majority of people were illiterate.



GALVANIZED IRON SHOE.

Stellite

A Paper Presented at the Thirty-seventh General Meeting of the American Electrochemical Society, Held in Boston, April 8-10, 1920

By ELWOOD HAYNES, President, the Haynes Stellite Company, Kokomo, Ind.

An account of the invention of Stellite and its varieties; its manufacture by melting together the constituent metals, or by simultaneous reduction of a mixture of the oxides of these metals by carbon or aluminum, in crucibles or in the electric furnace. Account is also given of the properties and performances of the alloy. [J. W. R.]

Realizing many years ago that an alloy that would take a cutting edge and at the same time resist the action of the atmosphere would fill a long-felt want, I made attempts even then to produce such a mixture or combination of metals. I found, however, that the problem was beset with many difficulties. Alloys containing copper were always subject to the tarnishing action of moist air and sulphuretted hydrogen; mixtures containing nickel and copper only possess the same disadvantages, though to a limited degree. Aluminum alloys with copper and nickel gave considerable hardness and a very high elastic limit, but they would tarnish in moist air, particularly in the presence of hydrogen sulphide.

In 1891 I made an alloy of nickel and tungsten, and, while this was not immune to acids, it resisted atmospheric influences remarkably well. This alloy was made by melting pure tungsten and pure nickel in a small crucible composed of a mixture of pure alumina and pure magnesia. The fusion was made in a small furnace of my own construction. The fuel used was natural gas, using air blast from a small foot-bellows.

Later, in 1898, I produced pure alloys of nickel and chromium by the reduction of their mixed oxides with pure aluminum. The alloy of nickel and chromium thus formed took a high polish, and retained its luster in boiling nitric acid when the chrominum constituted more than twelve to fifteen per cent of the alloy. This alloy could be filed rather readily, and could be worked cold into rods and sheets if sufficient care was exercised.

I next produced an alloy of cobalt with chromium in the same manner, but when the reaction took place a certain amount of free oxygen was evolved, and the metal was thrown from the crucible. This was due to the fact that the higher oxide of cobalt (Co_2O_3) was used, while in the former experiment NiO was employed.

The reaction for the production of the nickel alloy was as follows:

$$3NiO + Cr_2O_3 + 2Al_2 = Ni_3Cr_2 + 2Al_2O_3.$$

The reaction in the case of cobalt was:

$$2Co_2O_3 + Cr_2O_3 + 3Al_2 = Co_4Cr_2 + 3Al_2O_3.$$

It is obvious that by varying the proportions of the various oxides, alloys of varying compositions can be obtained.

It was only a step from this reaction to the production of the alloy by the simultaneous reduction of the oxides of their constituent metals by means of carbon.

Afterwards, they were produced on a commercial scale by melting pure nickel or pure cobalt with chromium. Since the cobalt-chromium alloys possessed great hardness and could be worked at a bright red heat, it seemed to be the more promising field for further investigation, and when, in the early part of 1900, large quantities of cobalt ore were discovered in Canada, and it became possible to procure the cobalt oxide at a comparatively reasonable price, I decided to place the alloy on a commercial basis.

The discovery of these alloys was first made public at a meeting of the American Chemical Society, in San Francisco, in 1910.

About this time I discovered that by adding tungsten or molybdenum to the cobalt-chromium alloy its hardness could be very much increased, though the addition of either of these metals in any considerable quantity rendered the alloy unworkable either hot or cold. It could, however, be cast into almost any desired form, and when cast bars were ground to a cutting edge and placed in the tool-holder of a lathe, the alloy at once showed a considerable advantage over high-speed steel as a lathe tool.

The first remarkable test of this sort was made in the machine shop of the Haynes Automobile Company. A large boring mill had been purchased for boring cylinders. This mill was supplied with a boring head in which were inserted small radial cutters which bored out the interior of the cylinders directly from the rough castings. I was informed by our superintendent that he had found it impossible to work the mill to more than half its rated capacity on account of "burning" the steel tools. We had up to that time made only a few tests on the lathe of Stellite tools, but he was very anxious to try the alloy in the form of boring cutters. I accordingly produced a set of cutters of Stellite, which were inserted into the boring head. When I came to the factory the next day, about 11:30 in the forenoon, I asked the man at the mill what success he had achieved, and he replied that he "had a day's work out at twenty minutes of eleven in the forenoon." In fact, he was boring more than twice as many cylinders in a day with Stellite tools as could possibly be bored with steel ones. This test fully demonstrated the practical utility of Stellite tools.

It was found quite difficult to make metal of uniform texture and quality in the form of castings, but most of the difficulties have been overcome, and we are now placing upon the market cast tools of various kinds made of Stellite, which are of standard quality both as to strength and hardness.

The alloys are made almost entirely in electric furnaces of the Snyder type. The materials composing the alloy are placed in the furnace in the usual manner, and the current turned on. The alloy fuses rapidly, without much oxidation, under the intense heat of the electric arc. We find that of the metals composing the alloy, chromium is most readily oxidized, while cobalt seems to show more volatilization, and tungsten is subject to the least change. It is true that the portion of furnace above the metal becomes filled with nearly pure carbon monoxide. This gas will oxidize chromium under certain circumstances at very high temperatures, though apparently no free carbon is produced in the furnace. This is probably because there is sufficient free oxygen or carbon dioxide to re-oxidize any carbon that may be temporarily produced.

At first much difficulty was experienced with the electric furnace linings, but after a certain amount of experimental work we were able to produce a magnesite lining which gives most excellent satisfaction in practice. When we first began the use of these furnaces, we considered ourselves fortunate if we could get eight or ten melts without either complete re-lining or heavy repairs. We now commonly obtain from two thousand to three

thousand melts from a single lining, and some of them stand even higher than this.

The electric arc, on account of its extremely high temperature, causes a certain amount of volatilization or oxidation in the melting of many metals, but Stellite withstands the conditions remarkably well, particularly after the fusion is once made. In melting scrap, however, if certain precautions are observed, only a very slight loss is experienced in re-melting. Stellite can be melted in covered crucibles under suitable precautions with a loss of less than two per cent, and sometimes it does not even reach one per cent.

Not only have the Stellite alloys containing cobalt, chromium, and tungsten, or cobalt, chromium, and molybdenum shown great economic advantage as lathe tools, but the binary alloys (consisting of cobalt and chromium only) have likewise received a wide application in the form of dental instruments, surgical instruments, pocket knives, etc. A modified Stellite alloy, known as Festel metal, consisting of cobalt, iron, and chromium, is also manufactured into table knives, which give excellent results.

All of the above alloys are practically immune to all atmospheric conditions, whether the air be moist or dry, or whether it contain minute quantities of sodium chloride or sulphuretted hydrogen. Knives made of this alloy can be used for cutting all sorts of fruit, including lemons, oranges, apples, etc., without becoming discolored in the slightest degree. A new and interesting application of malleable Stellite is as a substitute for gold in the manufacture of pen points for fountain pens. The tips of these pens may, if desired, be made of extremely hard Stellite, which can be welded to the malleable alloy. This application is particularly gratifying because the metals replaced, gold and iridosmium, are exceedingly expensive.

Middle-Aged Job-Seeking

The Experiences of an Old and Tried Superintendent in Hunting for a Position

Written for The Metal Industry by WILLIAM H. PARRY

The "poor fish" that approaches the fifty mark as life's years are counted, and finds himself out of a job in this "Land of the Free and Home of the Brave," is in for a most interesting time if he attempts to locate an employer worthy of the name as such who will even consider his claims of being a better and more valuable man at fifty than at any period in his career in whatever line of endeavor he has chosen for his life work. A recital of a few instances of recent occurrence ought to go far to prove that middle-aged men, especially in mechanical lines, are not wanted as executives, no matter how valuable may have been their experience or how good their records for "previous condition of servitude."

It seems to me that most advertisements in the technical press are jokes pure and simple when regarded as a medium of bringing employer and the one to be employed together. Ninety-eight per cent of them are fraudulent; the other two per cent are the result of paresis. I speak now of the advertisers who **think** they want help in the persons of those competent to act so, when as a matter of fact all the help they need is that of doctors and lawyers to keep them out of jails and insane asylums. This claim is a pretty broad one, even revolutionary, and to set out to prove it may appear to be "some job," but the proof is the least of our troubles.

A concern having its headquarters on Water street, New York City, thought they were in need of the services of an executive able to oversee the foundry and pattern shop end of their "business." They preferred to close with a man possessed of enough "long green" to invest ten thousand dollars in their "company." Everything went along beautifully until the intended victim, entirely on his own hook, visited "one of their plants" far down the Jersey Coast, only to find a collection of roofless and abandoned buildings once used as a bridge-building plant, and not in any way fitted for their alleged business. Needless to state, the ten thousand dollars were not invested, and the job went "blooey." This was a clear case of rascality.

Another New York concern with their magnificently appointed offices on Spring street, indicating prosperity from the gum-chewing "tripewriters" to the "Willie" who ushered you into the magnificent president's office, thought that a new executive, if put in charge of their plant in the Catskill region, would stir things up, but a visit to the plant on the part of the executive-to-be convinced him that there was no possibility of stirring things **there**, as the equipment was of Rip Van Winkle vintage and must have been in use long before poor old "Rip" took that long sleep. When this position was declined without thanks, the president, with the white lace fringe on his vest, acted as if he might get reckless and slam a door if he ever got really mad.

Poughkeepsie, N. Y., is a bully little town with a very energetic Board of Trade who, by ways that attract, have convinced many manufacturers to locate their plants there, and with that practice I have no complaint. But when one of those plants was over-valued two hundred per cent by a company who were to build motor trucks and tractors there, it was time to call a halt on taking a position with a concern who right off the bat could inflate values without batting an eyelid. Their advertisement for an executive was most alluring, but as they went into the hands of a receiver before they ever reached Poughkeepsie there was no great harm done.

I have refrained from mentioning the fact that the advertisements used in these three cases always mentioned "young men only," but as each and every one of them demanded that the applicants must invest from five to fifteen thousand dollars, and as they had not received any encouragement from young men with cash, their greed was greater than the need of help and they kindly considered middle-aged men with filthy lucre enough to risk in very questionable enterprises.

Out in the gay town of Cincinnati there are many **foundries** and pattern shops presided over by very competent men, yet one of the concerns got reckless a short time ago and spent a couple of dollars on an ad, asking for answers from prospective executives. Judging by the events that followed, the answers must have been very few, if any.

Being accustomed to high and riotous living in this town on the banks of the Ohio, the head of the concern spent some more money on advertising and eventually got at least one answer, but when he found that the applicant had reached middle age, he got the "blind staggers" and decided to give the position to one of the local gentry, which I am told is a habit in the Kaiserhofbrau-Wiener-Schnitzel town of Cincinnati..

Can you beat it?

Early Days in the Brass Industry

No. 2—Reminiscences of a Brass Man Who Remembers Old Times*

Written for The Metal Industry by THOMAS R. TAYLOR

The last two men spoken of in my first letter, Mr. C. P. Goss and Mr. Charles F. Brooker, came to the front about 1865, when the brass business began to make the rapid strides which have put the industry where it is today. Now Mr. Brooker is justly looked up to as the Nestor of the business, an honor which Mr. Goss shared until the time of his death.

Brown Brothers have a mill which I did not mention. I remember Mr. Philo Brown, Mr. William Brown and Dr. James Brown, the three men who organized and ran that concern. Had it not been for bad management, it would be one of the leading ones today, because it had all the large tube trade in the country, and that has since grown to great proportions. The firm is now Randolph and Clowes, and is the only one in the country that can make the largest boiler tubes.

Plume and Atwood are a new concern since I made my first appearance in Waterbury and they are very successful, as the mill is splendidly managed. Mr. Plume was the salesman and very energetic manager after the new mill was started. Its success was largely due to the establishment of a cutting up shop, where a great portion of its own product was used up for lamps and various other household furnishings which are made of sheet brass and rod. The people who started this concern were Mr. Israel Holmes, David S. Plume, John C. Booth and Lewis J. Atwood, all old brass men. Many times have I sat and talked with each one, for the important brass men of Waterbury were all approachable, even by a humble clerk such as myself. Mr. Gordon W. Burnham himself used to ride with me in an open wagon to Benedict and Burnham's and he was very talkative. One day when driving along, I said to Mr. Burnham: "Why, Mr. Burnham, you are the largest holder of brass mill stock in the country, if not in the world." He straightened up and demanded: "Young fellow, how do you know that? I never told you." I said, "No, sir, I found it out from the town records, because all the mills have to make returns to the town clerk after their annual meetings." "Well," he said, "that is right, my boy, and that is the way to get your education." Mr. Burnham started as a peddler of clocks and copper kettles, and later he became a very rich man, interested in every mill in Connecticut that made brass and also in those concerns outside the mills that were engaged in any manufacturing of brass. Benedict and Burnham were the founders of the Waterbury Clock Company, and I was with that firm while Mr. Burnham was president, up to the time of his death. Now the concern is in the hands of the Chase family, and has been one of the greatest clock companies in the world.

The Chase family came later in the brass business. Mr. A. S. Chase, father of Harry S., Irving H., and Fred S. Chase, was a banker who became interested in the brass mills and was at one time president of Holmes, Booth and Hayden. In this mill there were always two factions. Mr. Chase and Mr. Burnham could not agree and Mr. Chase had to retire, when Mr. Burnham was elected to succeed him. The next year Mr. Chase was elected president of Benedict and Burnham and remained in that position until the time of his death, several years ago. The sons of A. S. Chase are among the great men in the brass business today. They have two rolling mills, one of which is three-quarters of a mile long and three hundred feet wide—one of the largest mills in the country. All the Chase interests are owned by the family and very few people outside know even a little of their affairs. They are energetic, bright fellows and have been very successful. Their concern believes in the cutting up shop, and has control of several such shops which can keep one-half of the rolling mills busy supplying metal for their use.

There is an old time brass man who is still living, but who was never active outside of the Scoville Manufacturing Company's plant. I refer to Mr. Mark L. Sperry, who was for fifty years secretary of this company, and after the death of Mr. Goss he was made president. For knowledge of what is made of brass, who makes it, and how it is made, Mr. Sperry is a human encyclopedia. One can show him anything, and he knows what it is for and how it is made. If one has ever bought anything from the Scovill Manufacturing Company, even fifty years ago, Mr. Sperry can give the figures, the date of the order and the date of shipment within a very few minutes. He has everything indexed and filed where he can put his fingers on it at short notice.

Another man who was largely interested in the brass mills was John E. Smith, who, in my early days, was supposed to be a well-to-do man, worth about $40,000. Later he made more money after I knew him, and he was instrumental in forming the Manhattan Brass Company of New York. He and Colonel C. E. L. Holmes, together with a few other Waterbury people, were the founders of this concern, which is still doing business but is in entirely different hands. It has not grown like some of the other mills.

W. H. H. and L. T. Wooster were brothers who worked for the Waterbury Brass Company and for the Coe Brass Company for many years. They finally gave up their places there and started the Seymour Manufacturing Company which today is a large concern. They have always sold raw material and have been able to pick up business enough to keep their plant running without having an interest in any cutting up shop. This is about the only brass mill in the country today (and has been, since its organization forty years ago) that has been able to keep a mill busy without having any connection with a cutting up shop.

I must speak of another man who came to Waterbury later. This is Mr. E. D. Steele who came from New York State as a young man to go with the Waterbury Brass Company, and who became an important figure in the brass world. When he entered the field, the total amount of copper and spelter used in Connecticut for rolling brass did not amount to more than 2,000,000 pounds a year. This was considered stupendous then, but it seems very little when compared with the number of pounds in use today.

*The first article appeared in The Metal Industry, May, 1920.

Zinc Oxide

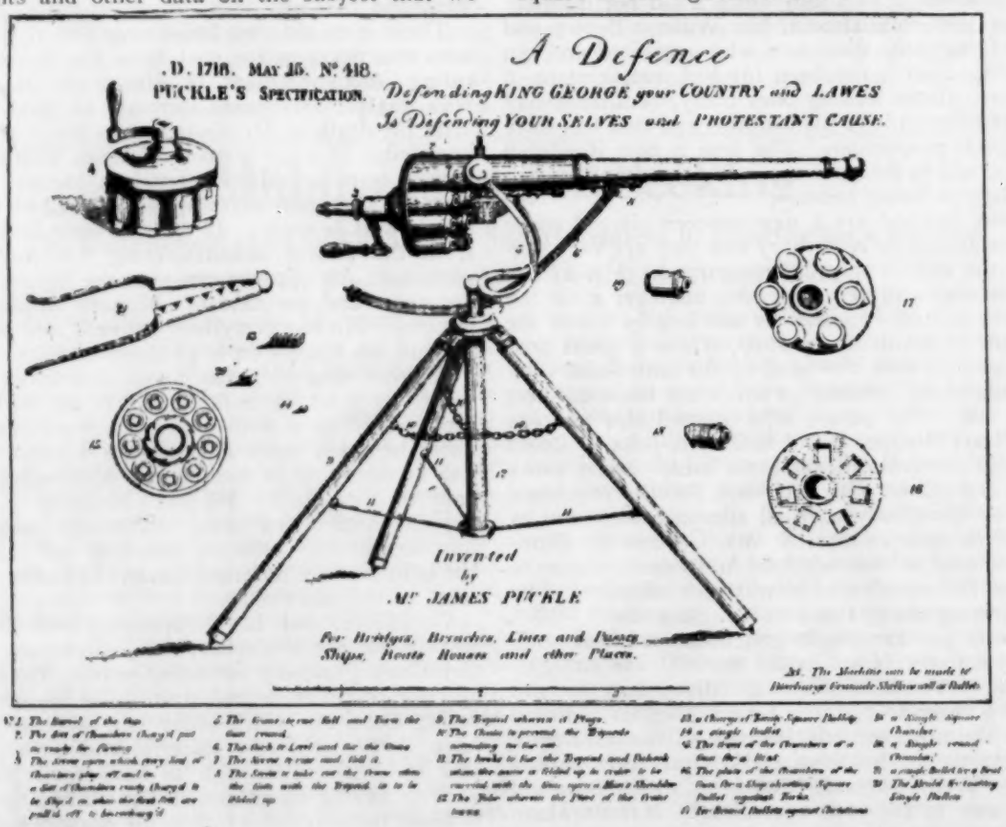
The Inter-departmental committee of the Bureau of Standards at Washington has adopted new specifications for paint to be purchased by the Government that provide for not less than 30 per cent of Zinc Oxide in the pigment mixture. This material prevents chalking; insures color constancy and gives longer wear to paint. Zinc Oxide has been used by the British Navy for half a century in battleship paint.

The First Machine Gun

An Interesting Patent Issued in 1718 on a Supposedly Recent Machine

It is the general impression that the machine gun is a very modern invention, even that the gatling gun, like that used in the Spanish-American War, was one of the early types of machine guns. The cut below proves that this idea is mistaken. Through the kindness of Mr. H. D. Hodge, of the Hodge Engineering & Contracting Company, Woolworth Building, New York, who is a specialist in munitions and who has the best collection of patents and other data on the subject that we have ever been privileged to see, we have been permitted to publish this copy of a patent on a machine gun issued May 15, 1718.

An interesting, an even startling sidelight on those time and conditions, is shown by the fact that two different types of plates for chambers are used for this gun. One (see note 17 under picture) is for "round bullets against Christians"; the other (see note 16) is for "square bullets against Turks"!


A Defence
A.D. 1718. May 15. N° 418.
PUCKLE'S SPECIFICATION.
Defending KING GEORGE your COUNTRY and LAWES
In Defending YOUR SELVES and PROTESTANT CAUSE.
Invented
by
Mr JAMES PUCKLE
For Bridges, Breaches, Lines and Passes
Ships, Houses Towns and other Places.

Whereas our Soveraign Lord King George by his Letters Patents bearing date the Fifteenth day of May in the Fourth Year of his Majesties Reign was Graciously pleas'd to Give & Grant unto me James Puckle of London Gent my Exors Admors & Assignes the Sole privilege & Authority to Make Exercise Work & use a Portable Gun or Machine (by me Lately Invented) call'd a — Defence in that part of his Majesties Kingdom of Great Brittain call'd England this — Dominion of Wales, Town of Berwick upon Tweed and his Majesties Kingdom of Ireland in such manner & with such Materials as Shou'd be Ascertain'd to be the sd New Invention by — Writing under my Hand & Seal and Inrolled in the High court of Chancery within Three Calendar Months from the Date of the sd patent as in & by his Majties Letters Patents Relacon being thereunto had Doth & may — amongst Other things more fully & at large appear NOW I the said James Puckle Do hereby — Declare that the Materials whereof the sd Machine is Made are Steel Iron & Brass and that the Treped whereon it Stands is Wood & Iron And that in the Above print (to which I hereby Refer) the said Gun or Machine by me Invented is Delineated & Described. July the 25th 1718.

Jas Puckle

4B 180

Metal Plating

Part 6—Tin Plating Methods—A Tabulation for Electro-Tinning Showing the Time Required to Deposit a Given Thickness of Tin withDifferent Values of Current Density*

Written for The Metal Industry by W. G. KNOX, Associated with the Chemical Laboratory of the Western Electric Company, Inc.

In the electro-motive series of metals, tin as given in several of the text books on the deposition of metals, is placed between nickel and lead. Its position in the electro-motive series is of particular interest in relation to iron or steel. It behaves the same as copper, nickel, lead, etc., in that it promotes corrosion of the ferrous metals where the latter are in contact with any of the more electro-negative elements in the presence of moisture.

Tin is applied to iron or steel and to other metals and alloys in one of three ways. These are:

1. Hot-dipping.
2. Contact or boiling.
3. Electro-plating.

Hot-dipping. The hot-dip method of tinning is the one most largely used and is considered to be most satisfactory where the coating is required to give the greatest protection.

Coatings applied by this method may be quite heavy, depending on the methods employed in applying them and in the subsequent treatment to even off or smooth out the surface irregularities. Coatings properly applied to iron and free from flaws, pin holes, etc., will give considerable protection against corrosion for the reason that the tin coating itself is not materially affected by the normal atmospheric conditions, but the tin coating will cease to afford much protection as soon as flaws or pin holes develop.

Contact or Boiling. This method is quite frequently employed on small sized parts or cheap work and probably answers satisfactorily only where the merest flash of tin is all that is required. On account of the very low weight of tin which is deposited by this method, it is practically without value as a commercial proposition where protection of the underlying metal is concerned. As a matter of fact it would be a waste of time to apply tin to iron or steel by this method unless it was intended as a preliminary coating or base over which a final finish of some other metal were to be applied.

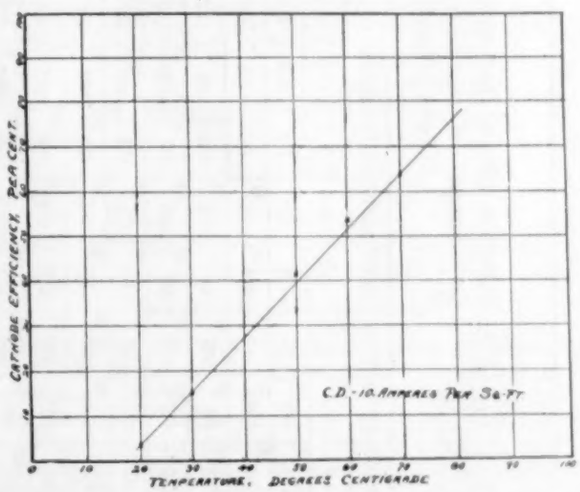
Electro-Tinning. The process of electro-depositing tin has been known for some years and the method has come into large use as a substitute for the hot-dip method. It is particularly useful when a light or moderate coating is to be applied to an object or even where a light color is necessary such as in an assembly of parts where harmony of color is of paramount importance. Electroplating has a further advantage in that the exact weight of metal per unit area can be more accurately controlled. This method is very well adapted to the finishing of parts which have threaded sections or which must be held to close dimensional limits.

There are a number of types of tin solutions used in the trade for electro-plating goods with tin. It is not the purpose of this article to suggest the best type or types of baths; suffice it to say that most tin baths require frequent attention, one of the troubles being the lack of sufficient anode corrosion to keep pace with the tin thrown out by the electric current. The addition of tin salt is usually sufficient to restore a faltering bath to its normal working condition.

It is probably more necessary to understand the proper working of a tin bath than for copper, nickel or zinc solutions since the efficiency of the tin solutions largely depends on the temperature at which the solution is operated. This is particularly true of the alkaline or caustic soda bath.

Some time ago the writer had occasion to deposit tin electrolytically on a number of metal sheets approximately 2 ft. long, 1 foot wide and 1/16 inch thick. After experimenting briefly with several solutions it was decided to use an alkaline solution. This solution was made up with the following materials approximately as follows: Tin chloride, 2.8 ozs.; caustic soda, 4 ozs.; water, 1 gal. The preliminary tests were made in a small two-litre glass vessel. The results of these tests shown herewith in graphic form illustrate quite well the effect of temperature on the cathode efficiency.

It is very likely that a solution stronger or weaker in tin



CATHODE EFFICIENCY OF TIN ELECTROLYTE AT VARIOUS TEMPERATURES.

content will show an efficiency somewhat different from the above, but for purpose of illustrating the point in question this one will suffice. The character of the deposit obtained at temperatures of 50° C. to 70° C. was entirely satisfactory, being quite smooth and firm for the weight which was required per unit area of cathode surface.

As a general rule in electroplating it is probably advisable to be satisfied with a deposit of, say, ten milligrams (.010 gram) per square inch of plaiting surface. Whenever a heavier coating is necessary, the work should be removed from the plating solution and brushed from time to time to remove the loose crystalline or pulverulent deposit which frequently forms under normal conditions.

The valence of tin in tin plating solutions is two. Therefore the table shown in this paper is calculated on that basis and holds for tin plating solutions of the various types. The plating efficiency of each and every solution

*This article is one of a series on metal plating which have been published in this magazine during the past year. Due to an oversight the curves relating to composition of solution and to current density for lead-antimony shown in the June issue, THE METAL INDUSTRY, were not properly indicated, but for a purpose of identification the readings should be from left to right. For parts 1, 2, 3, 4 and 5 see THE METAL INDUSTRY for June, 1919, August, 1919, January, 1920, April, 1920, and June, 1920, respectively.

should be determined by the operator in charge under normal working conditions and this observed efficiency used in calculating the time necessary for the work to remain in the bath for a given weight of deposit.

The table shown herewith is applicable to all tin plating solutions as previously stated, and the figures of time are given in minutes and seconds up to and including eleven minutes, above which the calculations are in hours and minutes. It is suggested that a current density of approximately ten amperes per square foot of cathode surface be employed in depositing tin from alkaline or caustic soda baths. Plating efficiencies should run around 40 to 60 per cent and may average considerably more if operating conditions are carefully regulated.

TIME REQUIRED FOR A THICKNESS IN INCHES OF TIN (DIVALENT)

Calculated on the basis of 100% cathode efficiency.

Hours, Minutes, and Seconds.

Current Density: Amperes Per Sq. Foot	Amperes Per Sq. Inch	.00001	.00002	.00003	.00004	.00005	.00006	.00007	.00008	.00009	.0001	.0002	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.001	.002
1	.007	:04 35	:09 18	:14	:19	:23	:28	:34	:37	:40	:47	1:33	2:19	3:06	3:52	4:38	5:25	6:11	6:57	7:44	15:28
2	.014	:02 18	:04 36	:06 53	:09 10	:12	:14	:17	:19	:20	:23	:47	1:10	1:33	1:56	2:19	2:42	3:06	3:29	3:52	7:44
3	.021	:01 53	:03 55	:04 53	:06 10	:07 44	:09 16	:10 49	:13	:15	:16	:31	:46	1:02	1:17	1:33	1:46	2:04	2:19	2:35	5:10
4	.028	:01 10	:02 19	:03 29	:04 38	:05 47	:06 57	:08 06	:09 16	:10 26	:12	:23	:35	:47	:58	1:10	1:22	1:33	1:44	1:56	3:52
5	.035	:00 45	:01 51	:02 47	:03 43	:04 39	:05 34	:06 29	:07 25	:08 21	:09 16	:19	:28	:37	:47	:56	1:05	1:14	1:24	1:33	3:06
6	.042	:00 46	:01 33	:02 19	:03 05	:03 52	:04 38	:05 24	:06 11	:06 57	:07 43	:16	:23	:31	:39	:46	:54	1:02	1:10	1:17	2:34
7	.049	:00 40	:01 20	:02	:02 40	:03 20	:03 59	:04 39	:05 19	:05 59	:06 37	:13	:20	:27	:33	:40	:47	:53	1:00	1:06	2:12
8	.056	:00 35	:01 10	:01 45	:02 20	:02 55	:03	:03 29	:04 04	:04 38	:05 13	:12	:18	:24	:29	:35	:41	:47	:52	:58	1:56
9	.063	:00 31	:01 02	:01 33	:02 04	:02 35	:03 06	:03 37	:04 08	:04 39	:05 10	:10 20	:16	:21	:26	:31	:36	:42	:47	:52	1:44
10	.070	:00 28	:00 55	:01 24	:01 52	:02 19	:02 47	:03 18	:03 44	:04 16	:04 39	:09 18	:14	:19	:24	:28	:33	:37	:42	:47	1:34
15	.105	:00 19	:00 37	:00 56	:01 14	:01 33	:01 52	:02 10	:02 29	:02 48	:03 05	:06 10	:09 15	:13	:16	:19	:22	:25	:28	:31	:62
20	.140	:00 14	:00 28	:00 42	:00 56	:01 10	:01 24	:01 38	:01 52	:02 06	:02 19	:04 38	:06 57	:09 16	:12	:14	:16	:19	:21	:23	:46
25	.175	:00 11	:00 22	:00 33	:00 44	:00 56	:01 07	:01 18	:01 29	:01 40	:01 51	:03 42	:05 33	:07 24	:09 15	:11	:13	:15	:17	:19	:38
30	.210	:00 09	:00 18	:00 28	:00 37	:00 46	:00 56	:01 05	:01 15	:01 25	:01 33	:02 06	:04 33	:06 13	:07 46	:09 18	:10 51	:13	:14	:16	:32
35	245	:00 08	:00 16	:00 24	:00 31	:00 39	:00 47	:00 55	:01 03	:01 11	:01 20	:02 40	:04	:05 20	:06 40	:08	:09 20	:10 40	:12	:14	:27
40	.280	:00 07	:00 14	:00 21	:00 28	:00 35	:00 42	:00 50	:00 57	:01 04	:01 10	:02 20	:03 30	:04 40	:05 50	:07	:08 10	:09 20	:10 30	:12	:24
45	.315	:00 06	:00 12	:00 19	:00 25	:00 31	:00 37	:00 45	:00 49	:00 55	:01 02	:02 04	:03 06	:04 08	:05 10	:06 12	:07 14	:08 16	:09 18	:10 20	:21
50	.350	:00 06	:00 11	:00 17	:00 23	:00 28	:00 34	:00 40	:00 45	:00 51	:00 56	:01 52	:02 48	:03 44	:04 40	:05 36	:06 32	:07 28	:08 24	:09 20	:19
Grams Per Square Inch		.0012	.0024	.0036	.0048	.0060	.0072	.0084	.0096	.0108	.0120	.024	.036	.048	.060	.072	.084	.096	.108	.120	240

Atomic Weight of Tin ---------- 118.7
Specific Gravity of Tin ---------- 7.3
Electro-Chemical Equivalent of Tin (Divalent)---- .000615

Note — Time below 11 minutes given in minutes and seconds; 11 minutes and above given in hours and minutes

TABLE SHOWING RATE OF DEPOSITION OF TIN FROM DIVALENT SOLUTION.

The Elements of Electro-Chemistry

Some Instructions for the Plater Who Wishes to Understand the Theory of What He Practices Daily

Written for The Metal Industry by JOSEPH HAAS, Jr.—Tenth Paper*

So much for theoretical considerations, and now for more practical ones. All compounds possess a definite degree of stability. Some are very stable and very hard to decompose, while others are less stable and easily decomposed. The degree of stability is determined by what is known as "heat of formation." The heat of formation of a substance is the number of calories evolved or absorbed when a grammolecular weight of the substance is formed. When heat is absorbed, the value found is negative. It has been found that the greater the heat of formation of a compound, the greater the E. M. F., or decomposition voltage required for the separation of the electric charges of the ions.

The "heat of decomposition," so called, must also equal the heat of formation for equal molecular weights. Zinc sulphate, whose heat of formation is 248,000 calories in dilute solution, requires a higher E. M. F. to decompose it than does $CuSO_4$, where heat of formation is 197,500 calories. The latter, again, requires a higher E. M. F. than does $AgNO_3$, whose heat of formation is 23,000 calories. These remarks above about decomposition voltage apply particularly where insoluble anodes are used. With soluble anodes, where the metal is dissolved almost as rapidly as it is deposited, there really is no decomposition of the salt. If the decomposition of the salt requires an E. M. F., then the formation of salt at the anode produces an E. M. F., and that is what actually happens at soluble anodes, the only E. M. F. required is that necessary to overcome the electrical resistance of the solution, so that theoretically no E. M. F. is required for decomposition.

A formula has been found for the calculation of decomposition voltages where insoluble anodes are used:

$$\text{E decomposition} = \frac{Q}{X \times F \times 0.24}$$

Where

Q = the heat of formation of 1 gram-molecule weight

F = 96,540 = the quantity of electricity necessary to dissolve, deposit or decompose 1 gram equivalent of a substance 0.24 = heat equivalent of 1 volt-coulomb or joule

X = valance of metal.

Problems: What voltage is required to decompose water the heat of formation of which is 69,000 calories? This value is based on the molecular weight in grams and water is divalent, or has two atoms of hydrogen.

$$\text{E decomposition} = \frac{69{,}000}{2 \times 96{,}540 \times 0.24} = 1.5 \text{ volts}$$

The calculation in the above problem is simple when the products of electrolysis are both gases and both are evolved or given off at the electrodes. But let us calculate the decomposition voltage of $CuSO_4$ whose heat of formation is 181,700 calories. Here at the cathode Cu is deposited and H evolved. At the anode, we have O evolved and H_2SO_4 formed.

Therefore:

Heat of formation of $CuSO_4$ = 197,500

Heat of formation of H_2O = 69,000

Total = 266,500

Heat of formation of H_2SO_4 = 210,200

Balance 56,300

Substituting in the equation given above we have:

$$\text{E decomposition} = \frac{56{,}300}{2 \times 96{,}540 \times 0.24} = 1.23 \text{ volts}$$

Another important problem is when it is desired to find the decomposition voltage of $ZnSO_4$ 5 H_2O the heat of formation of which is 593,000 calories.

Heat of formation of $ZnSO_4$ 5 H_2O = 539,000

Heat of formation of 5 H_2O = 345,000

Heat of formation of $ZnSO_4$ = 248,000

At the cathode Zn is deposited and H evolved, while at the anode O is evolved and H_2SO_4 formed. Therefore:

Heat of formation of $ZnSO_4$ = 248,000

Heat of formation of H_2O = 69,000

Total = 317,000

Heat of formation of H_2SO_4 = 210,200

Balance = 106,800

Then:

$$\text{E decomposition} = \frac{106{,}800}{2 \times 96{,}540 \times 0.24} = 2.30 \text{ volts.}$$

VOLTAGES USED IN PLATING.

Theoretically the only voltage or drop of potential that should be observed on a voltmeter connected to a plating tank is that which is only necessary to overcome the ohmic resistance of the solution. Outside of the copper sulphate and silver cyanide solution, this is not the case. The voltage in excess of that necessary to overcome the ohmic resistance may be due to several factors. In plating solutions, where anodes are not clear of oxides and hydroxides, the drop of voltage from the first observed is due to polarization caused by difference of potential between cathode solution and anode, the polarizing current flowing from cathode to anode. When cathode efficiency exceeds anode efficiency, the heat of formation of salt formed at the anode does not equal the heat of decomposition at the cathode. That is, the amount of heat that is formed at the anode is less than that formed by the decomposition at the cathode. Therefore a decomposition voltage is necessary.

From what has been stated here and elsewhere, the following are the contributing factors of the voltage necessary to carry on plating:

1. E. M. F. necessary to overcome the resistance of the solution.
2. E. M. F. necessary to overcome polarization.
3. E. M. F. for decomposition.
4. E. M. F. to overcome electrode potential of cathode.

*This series was begun in May, 1918.

Efficiency of Plating Solutions Affected by Electrode Potential.

That the electrode potential has a marked effect on the efficiency of cyanide copper and brass solutions has been shown by Watts and Baum, 7 A. E. S., 1917, in a paper entitled "Evolution of Hydrogen from Cyanide Plating Solutions." They have shown that the addition of considerable quantities of free cyanide raises the potential of the deposited metal until it equals and finally exceeds that of H, so that enormous quantities of H are evolved and deposited instead of metal, thereby lowering the efficiency of these solutions.

Standard Cells.

For the purpose of determining the values of electrode potentials, and other E. M. F. determinations, certain standard cells are used, so I will mention some of them, as we will have occasion to use them later on.

1. Helmoltz calomel cell consists of:

Zn | Zn Cl_2 solu, sp. gr. 1.409 at 15° C. | —Hg Cl — Hg

This cell possesses an E. M. F. of 1 volt at 15° C. The change of E. M. F. is small, being equal to +0.00007 for a rise of 1 degree in temperature.

2. The Clark cell:

Zn | Zn SO_4 paste — Hg_2SO_4 paste | Hg

Its E. M. F., according to the formula, is 1.4328—0.00119 (t—15)—0.00007 $(t—15)^2$ volts, where t is the temperature.

3. The Weston or cadmium cell.

This cell is the one most generally used.

Cd amalgam 10-15% | Cd SO_4 paste — Hg_2SO_4 paste | Hg

Construction of the Weston Cell.

The best form of vessel to use is an H-shaped glass vessel with platinum wire sealed in the closed ends of the tube. The vessel is supported on a wooden base by means of a metal clamp. The platinum wires are connected without strain to two terminals. Prepare a saturated solution of pure crystallized cadmium sulphate. Into one limb of the vessel there is poured a quantity of cadmium amalgam containing about 12.5% of cadmium. This is prepared by adding 1 part by weight of pure cadmium, free from zinc, to 7 parts of pure mercury and warming on a water bath. The amalgam, which is liquid at about 100°, should be well stirred with a glass rod and then poured into the limb of the vessel which is kept warm to prevent the glass from breaking while the amalgam is being poured in. When sufficient amalgam of one-quarter of an inch, the vessel is allowed to cool. The amalgam will solidify. On the top of this amalgam there is placed a thin layer of about one-quarter inch depth of moist, finely powdered cadmium sulphate crystals which have remained undissolved in the preparation of the saturated solution.

Into the other limb of the vessel is poured a quantity of pure mercury, so as to cover the platinum wire and form a layer of one-quarter inch, and on top of this is spread a layer of about a quarter inch of mercurous sulphate paste. This paste is made by rubbing together in mortar mercurous sulphate, mercury and a small quantity of cadmium sulphate and sufficient saturated cadmium sulphate solution to make a thin paste. The liquid is then decanted off and the paste rubbed up again with a quantity of the cadmium sulphate solution and again decanted. The process is repeated a third time in order to remove any mercuric sulphate which may be present. Having placed this paste on the top of the mercury, several fairly large crystals of cadmium sulphate are placed in both limbs of the vessel which is then filled up to within one-half inch of the open ends with the saturated cadmium sulphate solution. The open ends of the tube are then closed by means of paraffin wax, a layer of cork, and then sealing wax. When the cell is prepared in the above manner, its E. M. F. values are:

Temperature	E. M. F. in volts
5°C.	1.0189
10°	1.0189
15°	1.0188
20°	1.0186
25°	1.0184

(Fig. 8.)

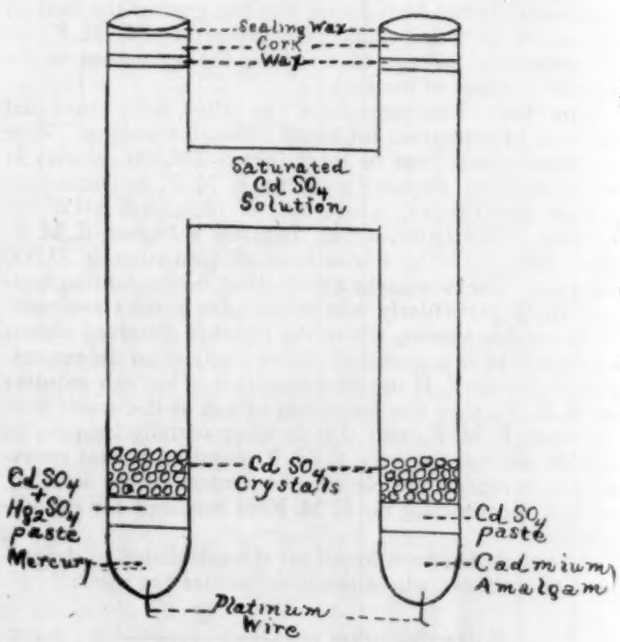


FIG. 8. WESTON CELL.

ALUMINUM WELDING

Q.—For some time we have been experimenting with aluminum welding, but so far have been unsuccessful in turning out a satisfactory job and we thought you might possibly be in a position to furnish us with some literature treating this subject. Any information you can give us along this line will be appreciated very much. We refer particularly to welding spouts on tea kettles, coffee pots and vegetable cookers in gauges 17 to 20.

A.—Many aluminum parts can be welded without preheating, such as lugs, spouts or projecting pieces. When a welding flame is applied to aluminum it will be noticed that the metal does not run together. A flattened iron rod should be used to puddle the aluminum and this rod should be wiped frequently so that it will not become coated. The rod should not be allowed to reach a red heat, thus causing oxide of iron to form on it, as this would cause a defective weld. A good aluminum flux should be used. The aluminum to be added should be in sticks of special composition to be obtained from the makers of welding apparatus. The quality of the flux and welding metal has much to do with the quality of the work.—P. W. B.

A Few Simple Electroplating Calculations

The number of B.T.U.'s absorbed in a given plating operation is given by the product.

$$\text{B.T.U.'s} = \frac{\text{Watts}}{1000} \times \text{Hours.}$$

$$= \frac{\text{Amperes} \times \text{Volts} \times \text{Hours.}}{1{,}000}$$

In every circuit through which an electric current passes, three factors are present: Electric pressure of voltage; Electric current or amperage; Electric resistance or Ohmage. There is a certain relation between these three factors; this is expressed by Ohm's law:

E = Electric pressure or voltage.
C = Electric current or amperage.
R = Electric resistance or ohmage.

$$\frac{E}{C} = R. \quad \frac{E}{R} = C. \quad E. = C \times R.$$

By this law it is possible, if two factors are known, to find the third. For instance, what current will pass through a circuit, with a resistance of 5 ohms, if we are using 10 volts? By Ohm's law, $\frac{E}{R} = C = \frac{10}{5} = 2$ amperes. Another example: If the voltage is 20, and 5 amperes are passing, what resistance is the circuit offering? $\frac{E}{C} = R = \frac{20}{5} = 4$ ohm resistance.

Law of Resistance.—The resistance of a conductor is directly proportional to its length, and the specific resistance of the material; and inversely proportional to the area of its cross section, or,

$R = \frac{Kl}{A}$ when K is the specific resistance, which for Copper is .00000066 ohm.
l is the length of conductor.
A is the cross sectional area.
R the resistance.

When two suitable metal plates are interposed in an electric circuit, and are placed a short distance apart in a liquid which is a solution of a chemical compound (called the electrolyte) the current will cause the electrolyte to be split up into its component parts. For instance, if the electrolyte decomposes into two gases, such as a very weak solution of sulphuric acid, then one gas will be given off at one plate and another gas at the other plate. If one of the constituents of the electrolyte is a metal such as with a copper sulphate solution, this will be deposited on one of the plates. This plate is called the cathode, and the other plate is called the anode. The process is called electrolysis. Electrolysis is also taken advantage of by metallurgists in producing pure metals such as copper.

Faraday has formulated the following laws of electrolysis:

1. The amount of electrolyte decomposed is proportional to the quantity of electricity which passes through it, and to the time.

2. The amount of each element deposited by unit quantity of electricity is a definite and constant quantity which is termed the electro-chemical equivalent of the metal deposited.

If the same quantity of electricity be passed through different electrolytes, the weights of the separated elements will be proportional to their chemical equivalents. These laws may be expressed:

$W = C \times e \times t.$

W = Weight in grams deposited by current of c amperes in t seconds.

e = is the electro-chemical equivalent which is the weight in grams deposited by 1 coulomb of electricity (one coulomb = one ampere flowing for one second, or 3,600 coulombs = 1 ampere hour).

The table gives the electro-chemical equivalents of the chief metals:

Example: What weight of nickel is deposited in 10 hours by a current of 5 amperes?

$W = 5 \times .00302 \times 10 \times 60 \times 60 = 54.36$ grams $= \frac{54.36}{453.6} = 0.1198$ lb. (nearly 2 ozs. *t*).

Note.—This is the maximum amount deposited under the best conditions, and would not ordinarily be obtained in practice.

How long will it take to deposit 1 lb. of copper by a current of 10 amperes?

By table, 1.182 grams of copper are deposited in 1 hour by 1 ampere.

∴ 1 gram of copper is deposited in $\frac{1}{1.182}$ hours by 1 ampere.

∴ 454 (approx.) grams (= 1 lb.) are deposited in $\frac{454}{1.182}$ hours by 1 ampere,

and $\frac{454}{1.182} \times \frac{1}{10} = \frac{454}{11.82}$ hours by 10 amperes, = 38.4 hours.

Comparison of Weights of two Different Deposits in the Same Circuit.—If a copper and a nickel bath are in the same circuit, then under the best conditions, the metals are deposited in the proportion of their chemical equivalents, that is, 31.8 parts by weight of copper are deposited for the acid bath in the same time and by the same current as 29.3 parts by weight of nickel.

Example: If the two baths are in series, what weight of nickel is deposited (theoretically) while 75 grams of copper are deposited?

31.8 parts of copper = 29.3 parts nickel.

∴ 1 part copper $= \frac{29.3}{31.8} = .921$ gram nickel.

∴ 75 gram copper $= .921 \times 75 = 69.075$ grams of nickel.

17.7 (nearly 18) amperes per sq. foot give a deposit 1/1000 in. thick, while in 10 hours:

177 amperes per sq. foot give a deposit 1/10 in. thick, and 17.7 amperes per sq. foot give a deposit 1/100 in. thick.

Hence an approximate idea of the thickness of a deposit can be readily obtained.

Example.—What thickness of deposit is produced by

30 amperes per square foot in five hours in an acid copper bath?

Now 177 amperes per sq. foot give 1/10 in. thick in 1 hour.

∴ in 5 hours = 5/100 in. thick, and 30 amperes = 5/100 in. × 30/177 in. = .0084 in. thick.

From the weight of a deposit and the time in which produced, the current density used can be found. Thus, a deposit of copper measures 3 × 2, and weighs 3.5 grams. It was produced in 15 minutes. Calculate current density.

3.5 grams in 15 minutes = 14 grams per hour.

$$14 \text{ grams per hour} = \frac{14}{1.182} = 11.85 \text{ amps.}$$

Hence current on 3 in. × 2 in. (= 6 sq. inches) = 11.85 amperes.

Hence current on 1 sq. foot (= 144 sq. inches) = $\frac{11.85 \times 144}{6} = 285$ amperes.

American Electroplaters' Society and the Manufacturers

An Appeal from the Founder of the Society to Manufacturers to Work for Their Mutual Interests

Written for The Metal Industry by CHARLES H. PROCTOR, Plating Chemical Editor

The recent convention of the American Electro Society held in Rochester, N. Y., was a splendid success, considered from every angle. The large number of well-known manufacturing firms represented by their platers, chemists and superintendents proved that the final finishing of the product of such firms has an important bearing upon efficiency of production because in many instances it is the final finish that is a prime factor in the selling of goods. It does not matter how well the goods may be mechanically produced; if they are not as well finished, their sale is retarded.

There are still many manufacturers who have failed to realize this most important factor, namely, the efficiency in plating and finishing their products. The American Electro Platers' Society is an educational institution the object of which is to raise the art to its proper level, to educate its members to a better understanding of the chemistry of electro-plating, to understand their problems from a scientific basis instead of rule-of-thumb methods that existed for many years, so that when trouble develops in a solution the remedy can be upheld by scientific methods based upon a chemical knowledge of the solution and its reactions, instead of guess-work. Rule of thumb, that formerly prevailed and even now prevails in many manufacturing plants, even though such plants are considered modern and up-to-date in mechanical production, belongs to the past instead of the present. The American Electro-Platers' Society was organized for such platers primarily, and, through them, for manufacturing plants and the manufacturers themselves. For years the writer has had a very intimate knowledge of plating conditions throughout the United States, and has been in personal touch with the metal industry. Yet it was disappointing to note that many, many firms were not represented at the convention. Surely the society is a part of the commercial life of every manufacturing firm interested in electro-plating or finishing of metals. The reason for this condition is in part the high cost of traveling, hotel accommodations and incidentals that necessarily become a part of traveling expenses incurred by attending the convention. Many platers find that the cost is excessive under present abnormal conditions, when such expenses have to be paid out of their own pocket, so in many instances they have to forego the pleasure of attending and lose much information of value to them that always comes from personal contact with their co-workers at such conventions.

Now, Mr. Manufacturer, Manager, or Superintendent, the reason for writing this article is to make a personal appeal to you from the founder of the society; to impress upon your foreman plater the importance of membership in the Society, for after all it is your work as much as your employer's that we are trying to improve. Send him to the convention, pay his expenses; even pay his dues in the local branches, as many progressive firms in the West and East are doing. They find that it pays because of the benefits the manufacturer eventually acquires from progressive ideas his plater absorbs and the elimination of waste that he learns to control through new methods of replenishing his solutions. I could cite a hundred instances where firms have been directly benefited because of the membership of their plater in the Society.

I want again to emphasize the fact that this is an educational society, intimately connected through reciprocal membership with the American Electro-Chemical Society and the U. S. Government, through the Bureau of Standards. I want so much to know just how much good this article will accomplish that I shall ask you some pertinent questions:

1. Is your foreman plater, or supervisor, or chemist, connected with your plating and finishing operations, a member of the society? If not, why not?
2. Will you make this investigation for the benefit of your plater and the interest of your organization as a progressive manufacturer?
3. Will you send your plater or chemist to the next annual convention, to be held in Indianapolis, Ind., June 30 to July 3, 1921?
4. Will you signify your willingness by just dropping me a line saying that if your plater is not already a member he will become one, and you will send him to the next convention?

The METAL INDUSTRY will transmit such information to me. I shall keep the data for reference, so that when the next convention approaches I can remind you of your promise. Many research chemists attended the convention. And for what reason? Seeking for additional knowledge. The motto of the American Electro-Platers' Society is KNOWLEDGE IS POWER. Give us, as a society, more power to gain more knowledge through the interest that you as manufacturers should show in supporting educational institutions that work along progressive lines for your benefit.

Zinc Chloride

According to woodpreserving experts, the railroads of the country could save four cents each year on all ties they buy if these were treated before being placed in use. On one division of the Illinois Central in Kentucky ties treated with zinc chloride in 1903 are apparently still in almost perfect condition.

The Operation of the Whitley Councils

Part 1—An Article Giving in Condensed Form the History, Development and Present State of England's Experiment in Cooperation Between Employer and Employee

Realizing, as all do, the importance of establishing sound relations between Capital, Management and Labor, we believe that a comparison of the English attempt to solve the problem with efforts along the same lines in the United States will interest all those who have encountered similar difficulties.—Ed.

Among all the schemes for the reconstruction of industry and the social order which have been evolved in Great Britain as the result of the Great War, none perhaps has aroused more hopeful attention than that for the formation of Joint Industrial Councils of Employers and Employed, popularly known as Whitley Councils. The Councils are the outcome of the appointment by the Government during the war of a Committee to consider the best means of promoting good relations between employers and employed. The Chairman was the Right Hon. J. H. Whitley, M. P. (Deputy Speaker and Chairman of Committee of the House of Commons) and the Committee was composed of representatives of the employers, of the trade unions and of Government departments. In a series of reports published in 1917 and 1918 the Committee set forth a number of recommendations as the result of which Joint Industrial Councils have been established in more than fifty industries, in which a total of between 3,000,000 and 4,000,000 workpeople are employed.

What the Committee declared to be necessary was "the establishment of an organization representative of employers and workpeople, to have as its object the regular consideration of matters affecting the progress and well-being of the trade from the point of view of all those engaged in it, so far as this is consistent with the general interest of the community."

With regard to the industries (classed as Group A) in which organization on the part of employers and employed was already sufficiently developed to render their respective Associations representative of the great majority of those engaged in the industry, the Committee saw no great difficulty in formulating plans for the Institution of Joint Industrial Councils and the assignment of functions and areas of operation. In their existing organizations the industries already had the means of carrying out for themselves to a large extent the recommendations of the committee and of forming Councils which could be recognized by the Government as entitled to put forward and to carry out proposals for the advantage of their particular industry as a whole. Therefore in these more highly organized industries the Committee proposed a triple organization of national, district and workshop bodies.

Two other groups, "B" and "C," were dealt with by the Committee in its second report. With regard to Group B, in which the degree of organization, though considerable, was less marked, the Committee recommended that the proposals of the first report should, in the main lines, be applied to those which, on examination by the Ministry of Labor in consultation with the Associations concerned, were found to be relatively well organized. The Committee, however, suggested that where in these industries a National Industrial Council was formed there should be appointed one or at most two official representatives to assist in the initiation of the Council and continue after its establishment to act in an advisory capacity and serve as a link with the Government.

For those industries in this second group which were less fully organized, it was suggested that District Industrial Councils should be formed, anticipating that in course of time the influence of the District Councils would be such that the industry would become suitable for the establishment of a National Industrial Council. The Committee, which had one woman member (Miss Mona Wilson) recommended that where women were employed in an industry the trade unions should include a number of women among those appointed as their representatives on the District Councils.

A much greater difficulty had to be dealt with in the third group, "C," consisting of industries in which organization was so imperfect, either as regards employers or employed or both, that no associations could be said to represent adequately those engaged in the industry. To these it was thought that at the outset the machinery of the Trade Boards Act might well be applied. This act was passed in 1909 chiefly with a view to dealing with the evils of "sweating" in certain trades.

The Whitley Committee suggested that the act might be used not only for its original purpose of securing a minimum wage in certain unorganized industries, but also as a means of supplying a regular machinery for negotiation and decision in certain groups of questions dealt with in other circumstances by collective bargaining between employers' organization and trade unions. The functions of the Trade Boards have accordingly been extended so as to enable them to initiate and conduct inquiries on all matters affecting the industry or the section of the industry concerned. A large number of new Trade Boards have recently been set up and it is hoped that these organizations will in time prove stepping stones to the full Industrial Council status—in other words, trade organization is encouraged.

The policy of the Committee, as summed up in the second report, was based upon organization on the part of both employers and employed. Where this was adequate, as in the industries of Group A, there was considered to be no need of external assistance. The amount of such assistance was to vary inversely with the degree of organization in industries. "We do not, however, regard Government assistance as an alternative to the organization of employers and employed. On the contrary, we regard it as a means of furthering the growth and development of such organization." This point is emphasized by the following quotation from the first report:

"It may be desirable to state here our considered opinion that an essential condition of securing a permanent improvement in the relations between employers and employed is that there should be adequate organization on the part of both employers and workpeople. The proposals outlined for joint co-operation throughout the several industries depend for their ultimate success upon there being such organization on both sides: and such organization is necessary also to provide means whereby the arrangements and agreements made for the industry may be effectively carried out."

It was recommended that the proposals of the committee should be applied not only to industry as conducted by private and incorporated firms, but also as far as possible to State and Municipal authorities and their workpeople. As a matter of fact some of the earliest and effectively worked Industrial Councils have

been those set up for Civil servants and other Government employees.

An interesting Supplementary Report deals specially with Works Committees. The establishment of such Committees, representatives of the management and of the workpeople, had been referred to in the first report as an essential part of the complete scheme. Defining the functions of Works Committees, the Supplementary Report said:

"In every industry there are certain questions, such as rates of wages and hours of work, which should be settled by District or National agreement, and with any matter so settled no Works Committee should be allowed to interfere; but there are also many questions closely affecting daily life and comfort in, and the success of, the business, and affecting in no small degree efficiency of working, which are peculiar to the individual workshop or factory. The purpose of a Works Committee is to establish and maintain a system of co-operation in all such matters.

The Committee refrained from indicating any form of constitution for the Works Committees.

"Our proposals as a whole assume the existence of organizations of employers and employed and a frank and full recognition of such organizations. Works Committees established otherwise than in accordance with these principles could not be regarded as a part of the scheme we have recommended, and might indeed be a hindrance to the development of the new relations in industry to which we look forward. We think the aim should be the complete and coherent organization of the trade on both sides, and Works Committees will be of value in so far as they contribute to such a result."

Caution is urged against the danger, in an industry in which the workpeople are unorganized, or only very partially organized, that Works Committees may be used, or thought to be used, in opposition to trade unionism. "We look upon successful Works Committees as the broad base of the Industrial Structure which we have recommended, and as the means of enlisting the interest of the workers in the success both of the industry to which they are attached and of the workshop or factory where so much of their life is spent. These Committees should not, in constitution or method of working, discourage trade organizations."

The recommendations of the Whitley Committee were accepted by the Government and under the direction of the Ministry of Reconstruction and subsequently of the Ministry of Labor, arrangements for the formation of Industrial Councils and other organizations were commenced. As the movement progressed, some modifications and developments took place but the main lines as laid down by the Whitley Committee proved generally acceptable and have not been departed from in any important particular. Among the functions of a National Joint Industrial Council as defined by the Ministry of Labor, was the regular consideration of wages, hours, and working conditions in the industry as a whole. But it was laid down that where a trade had been accustomed to deal with such questions through its already existing organizations the Joint Industrial Council should not touch such matters without the consent of the representatives of those organizations. Other matters suggested as coming within the scope of the Joint Industrial Council were the consideration of measures for regularizing production and employment; machinery for the settlement of differences; the collection of statistics and information; the encouragement of the study of processes and design and of research; the utilization of inventions and improvements in machinery or method; inquiries into special problems of the industry and the arrangement of lectures and the holding of conferences; improvement of the health conditions obtaining in the industry; the supervision of entry into and training for the industry and co-operation with the educational authorities; the issue to the Press of authoritative statements upon matters affecting the industry of general interest to the community; representations to the Government, Government departments and other authorities, and the consideration of matters referred to the Council by such authorities. To the District Councils have been assigned such questions as hours, wages and working conditions, including rules as to holidays, juvenile labor, overtime, the shift system, etc., and any matters which may be referred to the District Councils by the National Council or the Works Committees. Practically all the matters dealt with by the National Council for the promotion of the success of the industry and the improvement of health and other conditions may be dealt with by the District Councils, and co-operation with other District Councils in dealing with problems of common interest is recommended. Considerable progress has been made during the past year in this decentralization of the work and arrangements have been made by the Ministry of Labor for recording the work of the District Councils with a view to assisting co-ordination and co-operation. Similar work is being done with regard to Works Committees.

While these developments were in progress, there grew up a movement for organizing industry for the mutual benefit of employers and employed upon an even more comprehensive plan. This resulted last year in the summoning by the Government of a National Conference to consider the industrial situation in view of great prevalence of labor unrest. This was held at the Central Hall, Westminster, on February 27th, 1919. Invitations to send representatives had been issued to employers' Associations and Federations, Trade Unions and Federations of Trade Unions, Joint Industrial Councils, Interim Industrial Reconstruction Committees, Trade Boards, the Parliamentary Committee of the Trade Union Congress, the Parliamentary Committee of the Scottish Trade Union Congress, the Federation of British Industries, the National Alliance of Employers and Employed, etc. Altogether there were about 500 workpeople's and 300 employers' representatives present. The Prime Minister, the Minister of Labor, the President of the Board of Trade, the Postmaster General, the Minister of Food and other members of the Government were also present, as well as the principal officials of the Ministry of Labor. The Minister of Labor took the chair. A provisional Committee was appointed, consisting of representatives of employers and employed and including among the latter representatives of the Women's Trade Unions, was formed. This Committee subsequently appointed sub-committees to consider various questions affecting industry and those engaged in it including the establishment of a permanent Industrial Council to advise the Government on industrial and economic questions with a view to maintaining industrial peace.

Industrial Nursing

An Industrial Nursing Section of the National Organization for Public Health Nursing was formed at Atlanta, Ga., April 10, 1920.

Employers are eligible to membership in the National Organization for Public Health Nursing, and if they become members they may join the Industrial Nursing Section. Any who desire to become a member should join the National Organization for Public Health Nursing, 156 Fifth Avenue, New York, N. Y.

EDITORIAL

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STANDARDIZED NOMENCLATURE

A most important and commendable step has been taken by the American Society for Testing Materials, as evidenced by the reports of its Committee B-2 on non-ferrous metals at the 1920 meeting at Asbury Park. Definite recommendations were made for the standardizing of nomenclature of non-ferrous alloys in a systematic and logical manner. Such names as "composition," "nickel silver" and others which are neither accurate nor descriptive have been eliminated.

Brass pure and simple has been divided into three classes, yellow (63 to 80 per cent copper), red (over 80 per cent copper), yellow-red (55 to 63 per cent copper). Moreover, brass must contain nothing but copper and zinc. If any other metal is added, such as tin or lead, the alloy becomes a tin or lead brass of the particular kind that the brass happens to be. Thus we may have a tin yellow-red brass, which, although it may seem long and cumbersome, is an honest name and tells just what is in the alloy.

Bronze is to be a copper tin alloy only. The addition of other metals is shown by the proper prefix. Therefore, aluminum bronze is the name for a copper 92, tin 5, aluminum 3 alloy.

The name cupro-nickel is retained for alloys of nickel and copper in which the latter predominates.

A new departure was proposed in the name nickelene to take the place of "nickel silver," or "liberty silver," which was formerly "German silver." The old names have long been a thorn in the side of the metallurgist, as they were absolutely meaningless, and the new name is undoubtedly an improvement. Whether a name such as nickel brass would not be a better index of its content is a question, but certainly not important enough to quarrel about. The recommended name is adequate.

The work is not complete, of course. The proposed names cover only brass, bronze, cupro-nickel and nickelene, but the work has begun. We sincerely hope that these recommendations will be accepted not only by the Society for Testing Materials, but by the trade, with all possible speed, and that these committees may go on with their good work.

PLATERS AND THE BUREAU OF STANDARDS

One of the results of the Government's recent "retrenchment policy" has been a 30 per cent cut in the appropriation of the Bureau of Standards.

Of the value of the manifold activities of the Bureau it is hardly necessary to speak. Dr. Blum's lectures and the many publications need no comment. Manufacturing platers the country over have for years keenly felt, in the operation of their plants, the services of the electro-

plating department of the Bureau—they will undoubtedly be as keenly sensitive to any curtailment of this service.

This 30 per cent reduction in its activities is in many ways most regrettable, particularly at this time when high costs make it imperative to discover all possible improvements. It is unfortunate that we must lose the services of three out of every ten men whose full energies have been directed to the solution of the platers' difficulties. It is a pity that every three pieces of investigation out of ten must be halted—with the irreparable loss that is inevitable when work and men are stopped in tasks half done. And the misfortune grows increasingly in size as the hundreds of manufacturers who have been aided by the full activities of the ten men in the ten jobs receive only the curtailed activity of the seven men of the seven jobs. The new work that has been planned and must be postponed is simply another phase of the misfortune, of which there is no measure.

It has seemed to us that in this emergency the many manufacturers who have depended upon the Bureau in the past should take measures to preserve for themselves this same unstinted service in the future. "A penny saved is a penny earned"—the old adage might have attributed the same truth to a penny well spent. There can be no better way of spending the pennies well than to make up the deficit in the Bureau's appropriation by contributions from manufacturing platers. The Bureau has meant dollars and cents to platers in the past; these pennies well spent will insure that it will mean dollars and cents in no less measure in the future.

BUREAU OF STANDARDS DETECTIVES

A recent example of the usefulness of the Bureau of Standards has attracted much public notice. It was discovered that large quantities of platinum were being stolen from the Roessler and Hasslacher Chemical Company, the Bureau of Standards Laboratories, and the laboratories of the Universities of Missouri and Louisiana.

In a report made for the American Chemical Society, the work of the Bureau of Standards in discovering the criminals was explained as follows:

"The Bureau of Standards as well as industrial plants and universities had been much hampered by the stealing of its platinum, worth intrinsically four times its weight in gold, to say nothing of its importance in scientific work. Two men were arrested last April while attempting to dispose of 280 troy ounces of platinum 'sponge,' the porous state of the metal. They had left small lots with two firms who, having circulars concerning various thefts, notified the authorities. The remainder of the sponge was found in two rubber hot water bottles which the accused men had been carrying in a satchel.

"Immediately on learning of the arrests the Bureau of Standards assigned Dr. E. Wichers of its staff, a member of the American Chemical Society, to assist the United States Attorney General and the Department of Justice. Dr. Wichers concluded there must have been still larger losses than had been reported, judging from the amount of the element in the possession of the prisoners. The exact composition of definite consignments of platinum is fairly well known to chemists. The slight variations are due to traces of other substances, such as 'iridium.' Just as dealers in gems declare that important diamonds are so registered that it is difficult to dispose of stolen ones, so the Bureau of Standards used the same principle in solving the mysteries of platinum piracy.

"Chemical analysis indicated that the seized supply had come neither from the New Jersey plant nor from the laboratory of the Bureau of Standards.

"In its quality the captured consignment closely resembled the stocks at the War Department Plant at Nitro, W. Va., where the inventory showed there should be 5,000 ounces of sponge, and also the stock at a Government military plant at Jacksonville, Tenn. As some of the platinum at Nitro was known to contain a large percentage of palladium, that in the satchel seemed to have come from Jacksonville."

"Government agents immediately went to Jacksonville and discovered that one of the men arrested had been employed in the Old Hickory Powder Plant at Jacksonville. The investigation led to the Government reservation and resulted in the arrest of an assistant chemist who was implicated in a confession as the man who had taken the metal from the Government's stocks."

This is simply one of the innumerable ways in which the Bureau of Standards is of service. From this it appears that it is a help not only to manufacturers, but to the Department of Justice. We can only repeat what we have stated again and again; that the Bureau, of all government departments, should not be dealt with in a niggardly fashion. It is not a financial deadweight, it is not a "poor relation" to be treated as if it were receiving charity. It is an immensely useful and profitable institution.

METAL VERSUS WOOD

The yacht races are over and the cup still remains with us. We must admit to mingled feelings about the outcome. We are, of course, certain that, as Sir Thomas Lipton generously admitted, we had the better boat. Nevertheless, it might have been very desirable for the cup to have gone with the challenger for a period, at least. There is such a thing as winning too often for the good of the sport, and certainly nobody deserved to win, from a purely sentimental point of view, more than Sir Thomas Lipton.

We cannot refrain, however, from poking our finger into the pie. As previously explained, the Shamrock was built of wood and the Resolute largely of metal. Whether any part of the victory was due to the material of which the yachts were made would take a combination of yachtsman and metallurgist and physicist to determine. Nevertheless, we do feel that the metallurgists and the manufacturers who took part in the production of the manganese bronze shell, the nickel steel framing, the Duralumin gaff, the aluminum deck plates, and even the lead keel have no inconsiderable share of the victory. To be sure, this share is only one of a large number, among which are those allotted to the designers, financiers, builders, and last but probably as much if not more than any others, the navigators. There is enough glory to satisfy everyone who had anything to do with the cup defender, and a considerable measure in addition for the challenger. We sincerely hope that he will return soon.

CORRESPONDENCE AND DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

IMPRESSIONS OF AMERICAN BRASS MILLS

Below are letters, kindly sent us by Mr. A. Spittle and Mr. G. H. Whiteman, of Allen Everitt & Sons, Ltd., Birmingham, England, who visited us a short time ago to investigate the use of electric furnaces in brass mills.—Ed.

To the Editor of THE METAL INDUSTRY:

I am sorry I did not have an opportunity of seeing you in New York. I found your letter awaiting me on arrival.

As Mr. Whiteman has dealt fully with the question ot our visit, there is nothing for me to say.

I had a very pleasant time in America, and I shall always look back on my visit with feelings of gratification.

Yours very truly,

A. SPITTLE,
Allen Everitt & Sons, Ltd.

Smethwick, near Birmingham, July 9, 1920.

To the Editor of THE METAL INDUSTRY:

I received your letter on my return from America and, as requested, I give you herewith my impressions of the Brass Industry of the United States, and some points in which American practice differs from that of English manufacturers.

I must qualify my remarks by saying that my stay in the U. S. A. was brief, and that the bulk of my time was occupied on the primary object of my visit, which was to enquire into the possibilities of electric melting as applied to non ferrous metals, but in the brief time at my disposal I was privileged to see a number of typical American Brass Mills, and was extremely interested in the various processes shown to me.

I found electric melting more generally in use than I had anticipated. There was considerable divergence of opinion as to the most suitable type of furnace for Brass and Copper melting, but all users were certain that electricity would supplant the older means of melting to a large extent in the near future, and they backed up their opinions by placing data before me of a convincing character.

Dealing with the subject of my impressions of the Brass Industry generally, I feel that the point of difference which impressed me most, was the large areas of land which the various corporations have secured for the sites of their factories, as compared with the sites upon which most English factories are built. As a consequence, the layout of the American factories has been designed and carried through untrammelled by considerations of any need for economy in the matter of floor space. The advantage of this is shown in the freedom of movement around the machinery, the ease with which large quantities of material can be brought up to or removed from the point of treatment, and the possibility of storing a comparatively large quantity of stock in the immediate vicinity of the point where the next operation has to be performed upon it. By comparison most English mills are cramped for room, gangways are narrow, making transport difficult, while stock has to be stored remote from the machines, and brought up to them in small quantities.

The use of labor saving devices has been carried further in America than in England. This has in some degree been rendered easier by the adoption of standard sizes, as the latter lend themselves to continuous production of one size, and therefore to the economic use of machinery designed for repetition work.

The English manufacturer has a small market for his products. The quantities called for are smaller, and more varied in size than are asked for in America.

This condition calls for more frequent changes in tools, etc., and thus creates a position at times where machinery of a special character for mass production, which gives good results under American conditions, cannot be economically used under English conditions, owing to the frequency with which the setting has to be changed.

The high price of labor in America as compared with England has in the past stimulated the efforts to use mechanical means of handling in the former country, but during and since the war, labor charges have been increased so rapidly in England, that manufacturers are being compelled to look closer into the uses of means for reducing hand work and increasing the output.

I would like to bear testimony to the courteous and hospitable manner in which I was received everywhere in U. S. A. and Canada. I was freely shown around the various factories, and wherever a process was likely to be of special interest, care was taken to draw attention to it. Economic problems of the trade were openly discussed, and comparisons between English and American practice were made, and the differences criticised. I left America with the most pleasant recollections of my visit, which I hope to repeat at no very distant date. I have made many new friends on your side of the Atlantic Ocean, and I hope I shall have the good fortune of seeing most of them on this side soon, and of returning, as far as lies in my power, the cordial welcome they extended to me.

Yours faithfully,

G. H. WHITEMAN,
Allen Everitt & Sons, Ltd.

Smethwick, near Birmingham, July 9, 1920.

A BOOST FOR ROBERT J. ANDERSON, METALLURGIST, BUREAU OF MINES

To the Editor of THE METAL INDUSTRY:

Lincoln said, "You can fool some of the people all the time and all of the people some of the time, but you can't fool all the people all the time," and these manifest truths were never better exemplified than when the Bureau of Mines recently released Robert J. Anderson's report on "Blowholes, Porosity and Unsoundness in Aluminum Alloy Castings."

Your review of this report in the July issue of THE METAL INDUSTRY is all right as far as it goes, but the great essentials, such as proper design, pouring temperatures, the avoidance of the deoxidation cure-alls, are touched upon but lightly, if at all.

Reams upon reams of alleged technical literature bearing on this subject have been published by the technical press of the world, and just about ninety-nine per cent of it is bunk, pure and simple. Mr. Anderson is the "Candy Kid" to slide the skids under the whole bunch of so-called experts in a manner that compels me to show my unbounded admiration for his splendid work.

I suppose that this report, being distributed free by the Bureau of Mines, will not be appreciated because of that fact, but as for me, I can say that if I could not procure another copy, it would take a roll of money big enough to choke a hippopotamus, to pry me loose from it.

Beg, borrow or steal a copy is my advice to anybody interested, and note how he slams the designers who don't design, the melters who don't melt, and the flux experts who don't flux, except possibly your money, which they "clean" you out of pretty thoroughly while failing to clean aluminum alloy castings of blowholes, porosity and unsoundness.

New York, July 21, 1920. WILLIAM H. PARRY.

THE ELECTRO-PLATERS' CONVENTION

To the Editor of THE METAL INDUSTRY:

The encouraging reports that were received during the convention of the possible formation of new branches is convincing proof that the Society is rapidly gaining in numbers and is the medium through which the platers might have the opportunity to advance their knowledge in Electroplating.

An important feature was the strongly contested amendment to the constitution, to admit assistant platers to membership which lacked the necessary majority vote, the consensus of opinion being opposed, and while recognizing that some value might be derived from this move, most believe that the best interests of the Society may be served by the present status of qualifications for membership.

Wyandotte, Mich., July 12, 1920. OSCAR E. SERVIS.

MERCURY MIRRORS

To the Editor of THE METAL INDUSTRY:

Referring to problem No. 2840, we have had quite a little experience with old mercury back mirrors, and have found that the coating has eaten into the glass and that the glass itself is more or less discolored from the action of the light. The discoloration on very old mirrors is of purple or violet tone in blown glass mirrors and yellowish to greenish in plate glass mirrors. The removal of the old coating can be accomplished as you suggest and with scraper or brush. But it is necessary to repolish the glass itself and the result, especially in old mirrors, is apt to be very dead, and at a cost greater than that of a new mirror. Sentimental reasons aside, it is best to scrap the old mirror and replace by a new one.

The mercury process has been obsolete for twenty-five or thirty years. It was revived for the work at the hotel St. Regis some seventeen years ago, and as far as we know has not been in use since. The process gives better result than the present "patent back," but the danger of mercury poisoning led to its abandonment

C. F. BIEHLE,
New York, July 20, 1920 Charles F. Biele & Sons' Co.

To the Editor of THE METAL INDUSTRY:

I have just been reading your Shop Problems with the usual interest, and I am constrained to add a word to one paragraph. I refer to Problem 2840, pages 327-8, in the July issue, regarding the dissolving of old quicksilver on the back of mirrors.

It occurs to me that a little hot caustic solution might be very helpful. For the last two and a half years I have been spending a good deal of time on the problem of getting things into solution, and I find that hot caustic is a more useful substance than I used to realize, especially when such metals as tin, lead, aluminum, etc., and their compounds, are involved. Of course, I do not mean by this to minimize the importance of the acids, but merely to suggest the caustic, which is cheap and handy. C. M. HOKE.

New York, July 16, 1920.

NEW BOOKS

ALUMINIUM, by G. Mortimer, published by Isaac Pitman & Sons, 2 W. 45th St., New York City. Size 4½ x 7, cloth binding. Price, payable in advance, $1. For sale by The Metal Industry.

The literature of some branches of the industry lags a long way behind the technical progress attained and this is especially true of the production and use of aluminium. Up to the present moment only three books can be recalled on the subject in the English language and of these one is very voluminous and expensive, another is fifteen years out of date and the third gives only the chemists' viewpoint. A new book, "Aluminium," just published by Isaac Pitman & Sons, has been written by Captain George Mortimer of the British Royal Air Force and helps in a modest way to bring the subject up to date.

The chapters on production are concise and confine themselves to the methods now in practical use. The author dismissed the probability of reducing the silceous clays and makes no mention of the possibility of securing alumina from alunite as a by-product of a potash recovery process, although this scheme has considerable promise.

The reaction in the reducing of aluminium oxide to the metal is quoted as:

$$2Al_2O_3 + 3C : 4Al + 3CO_2$$

(Surely that aluminium ought to be molecular!) which is the theory put forward by Dr. G. H. Bailey in 1917, replacing the older hypothesis of the reaction:

$$Al_2O_3 + 3C : 3CO + Al_2$$

In other words, the modern theory involves just 50 per cent. of the carbon consumption and consequently opens a wide field for improvement in efficiency.

Statistics of the price af aluminium are given, but not of the main factor on which price depends—that of capital cost. The fact is that the preponderating element in the price of nearly all metals is that of working cost, while in the case of aluminium it is the interest on bond investment in dams, penstocks, electrical machinery, power and furnace houses and mills. If a ten million dollar plant built ten years ago produces 6,000,000 pounds of metal per year then the interest charge per pound will be 10 cents, but at the present time not only would the same plant call for more than $20,000,000 capital, but it would be next to impossible to raise this amount at 6 per cent., so the interest charges per pound of metal cannot be less than 20 cents. It is fair to conclude, then, that the aluminium produced from modern plants will always carry a higher price than was the case seven to ten years ago.

Alloys of aluminium are the most important aspect of the metal now and the author, who has made many experiments in the foundry and laboratory, gives a useful chapter on the subject. The zinc and zinc copper alloys are treated with caution ond the mixture:

Aluminium	92 per cent.
Copper	7 "
Tin	1 "

recommended for ordinary sand castings subject to vibration in addition to the ordinary stresses. Such a mixture gives only 14,000 pounds with 2 per cent. elougation, however, and it would hardly meet American specifications. Nickel is not commonly adopted in America as a hardener, but is recommended by the author up to 5 per cent., with 3 per cent. copper, and in general this chapter gives an interesting sidelight on British practice in the light alloys.

There are several uses of aluminium treated in this book which are quite common in Europe, but have not been developed here. The use of the bare-oxidized wire for winding magnet coils has produced a winding which is as near as possible fireproof and free from deterioration. Aluminium fuse wire is also commonly used over there. The professional will learn something from this book as well as the layman.—Ernest V. Pannell.

The Art of Enameling on Metal, by W. M. Brown, published by Scott, Greenwood & Son, London. Size 5 x 7½. Cloth binding. Price, payable in advance, $2. For sale by The Metal Industry.

A brief description of the methods and apparatus used in laying enamel of various colors on metal. Also descriptions of the preparation of the enamels themselves.

The Journal of the Institute of Metals, Volume 23, published by the Institute, 36 Victoria street, London, England. Cloth binding. Size 5½ x 8⅝. Price, payable in advance, 31s. 6d. to non-members, or 15s. 9d. to members (postage 6d. per volume extra in each case).

This volume needs no review, as it is one of a series of semi-annual volumes put out by the Institute. It is as usual divided into two sections. The first includes technical and scientific papers; the second gives abstracts of papers published elsewhere. There is an unusually large proportion of practical papers, and less of the purely scientific, in this volume.

The Mines Handbook, by Walter Harvey Weed, E. M., published by W. H. Weed, New York City. Cloth binding. Size 5½ x 8⅝, with over 2,000 pages. Price, payable in advance, $15. For sale by The Metal Industry.

This is one of the most useful and complete works published. It is an enlargement of the Copper Handbook founded by Horace J. Stevens in 1900, and is, in effect, a manual of the mining industry of the world. It covers the mining industry for 1918, 1919 and the first quarter of 1920; it has been entirely rewritten, and descriptions of newly organized companies added.

To the metal user this book is of considerable interest, because of the valuable statistics on metal production and the information about the industries. Descriptions of metallurgical reduction plants of any importance can be found, including very careful and honest statements about their size, operating methods and general standing. There is no other work which so well covers the field of metal production and extraction from the business point of view.

A list of mining companies of the work with an authentic statement of their activities and financial condition makes it a most useful volume for investors.

We personally can speak for the usefulness of The Mines Handbook, as it supplied a large part of the information included in the article on the Distribution of Copper (published in the May issue of THE METAL INDUSTRY).

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; CORYDEN P. KARR, Exchange-Research }

BENDING TUBES

Q.—We are very desirous of obtaining information relative to the bending of light gauge brass tubing around small diameters. To be specific, No. 22 stubs gauge, 1½" O.D. diameter is to be bent. or drawn through 180° round its own diameter or a ¾" rad.

We would greatly appreciate information from you relative to the methods employed in performing this operation as well as the names of manufacturers making machines to accomplish this.

A.—It will be necessary for you to procure a machine or special tools if you have a quantity of these bends to make. If a few you will have to use resin or lead and fill the inside with same. Also the tubing should be thoroughly annealed. I can refer you to an article covering the Bending of Brass Rod and Tubes, which appeared in April, 1919, issue, pages 172-3, of THE METAL INDUSTRY, which also shows illustrations of different pipe bending machines.—P. W. B. Problem 2,846.

BRASS VANITY BOXES

Q.—The firm which employs me are adding some lines of goods, which I have never had any experience in doing. One line is a round box 1½ in. dia. ½ in. deep (vanity box). We have samples which I am expected to duplicate. One finish is on a light colored brass, frosted or matt finish; one finish is fine matt and another not so fine. Another is darker shade of brass, either burnished or bright dipped, and lacquered.

1. What is the general practice in handling this line of goods? Is there any hand work to it, such as buffing, etc.?
2. What is the mixture of metal which gives about 14 karat gold color, and how is it produced?
3. Can you give a good, dependable dip to produce matt finish?
4. What is a good (a) Satin dip, (b) ormolu dip, (c) does an ormolu dip produce a matt finish?

A.—The sheet brass used in the manufacture of small vanity or puff boxes is known as high yellow brass, the composition being 66 parts of copper and 34 parts of zinc. Low brass is also used and is composed of 80 parts of copper and 20 parts of zinc. Low brass sometimes contains a higher percentage of copper and it is then called oreide metal, which very closely resembles 14 karat gold. Such articles are usually finished in ormolu or satin finishes by acid dipping and quite frequently they are dip gilded in a regular dip gold solution.

The method of finishing is to clean thoroughly, dip lightly in a mixture of equal parts of sulphuric acid and nitric acid, to give a uniform acid dipped surface, and then follow up with the ormolu dip consisting of 2 parts of sulphuric acid and 1 part of nitric acid, then adding oxide of zinc until the solution becomes saturated. The dip is used hot and it must be kept free from water. The finish is regulated by the proportions of acid used. If the formula as given above produces too coarse a matt then sulphuric acid must be added slowly and should be tested until the desired matt is produced. If the matt is too fine and bright then more nitric acid must be added.

Aluminum baskets should be used for the dipping operations. These baskets should be made with a cover so that it can be fastened and the article shaken thoroughly while dipping and in the washing operations.

If you desire to gild them afterwards we can furnish you with formulæ for gold dips, etc.—C. H. P. Problem 2,847.

COPPER PLATING

Q.—We are having considerable trouble with our nickel tarnishing from heat and we are wondering if you could offer us any suggestions that would help us overcome this trouble. We have thought some of copper plating. At the present time we are doing five and six-wheel work in our polishing room and we are under the impression that by copper plating we can cut this down to about three-wheel work, buffing twice, and do it at a cost not any greater than our present method.

A.—Heavy deposits of nickel should not tarnish under the influence of heat unless the heat is excessive. It would be advisable and profitable to copper plate the parts first. It is possible also that it might help the tarnishing you mention.

The wheel work could easily be reduced to three operations, perhaps to two by depositing a fairly good coat of copper from a hot copper cyanide solution and then afterwards color buffing to a finish, before nickel plating, and then recolor after nickel plating.

A solution for copper plating for heavy deposits should be prepared as follows:

Water	1 gallon.	Temp. 160° Fahr.
Sodium cyanide	6½ ozs.	
Copper cyanide	6 "	
Bicarbonate of soda	3 "	
Hyposulphite of soda	½ "	

Temperature, 120 to 140 degrees. Voltage, 2½ to 3½.

To prepare the solution dissolve the sodium and copper cyanide in one-third the total amount of water to be used in making up the solution (number of gallons) at a temperature of 140 degrees. Then add the balance of the two-thirds water cold, the sodium bicarbonate and hyposulphite, thoroughly stir, and the copper solution is ready for work. Use anodes of soft rolled or cast copper.—C. H. P. Problem 2,848.

CYANIDE SUBSTITUTES

Q.—Not being able to get cyanide of potassium we have been using chloride of sodium, but find that in the solution there is a sediment which tarnishes our work and causes the nickel plate to peel off. Will you kindly advise us how this can be remedied?

A.—We do not believe that you have used cyanide of potassium for plating solutions for several years as there has not been any available. You have probably been using sodium cyanide 96-98 per cent which is the best cyanide produced. Furthermore we cannot see how chloride of sodium could possibly be used to replace any cyanide combination.

The function of sodium cyanide, cyanide chloride mixture or potassium cyanide, when used in solution, is to remove oxides from the base metal if of brass or bronze, before nickel plating, so that a perfect adhesion of the nickel may result on the base metal. Sodium chloride will not reduce oxides, but will cause stains to appear on the brass or bronze, which is no doubt the cause of your trouble.

If cyanide is not obtainable, a solution of muriatic acid and water may be used temporarily as a substitute to remove the oxides. Try the following formula:

Water	1 gallon
Muriatic acid	4 ounces

—C. H. P. Problem 2,849.

BUTLER FINISH

Q.—Please tell me how to obtain a Butler finish on silver.

A.—To produce a satisfactory Butler or platinum finish it is always advisable to cut down the surface lightly first and then finish with a bristle brush and fine powdered pumice stone and water or powdered silica. Some firms use goats' hair brushes and tallow mixed with paraffine wax. It is possible you can produce a finish that will prove satisfactory in one operation by this method without previous polishing of the plated surface. Run your wheels about 800 to 1,000 revolutions per minute.—C. H. P. Problem 2,850.

ETCHING

Q.—You will find enclosed a sample nameplate illustrating a white matt finish. After much effort and expense we find that we cannot produce this. We have tried silver and nickel and have prepared our metal with sand blast, scratch brush and acid dip.

A.—We can only give an outline of the methods to pursue to obtain results similar to the sample nameplate submitted to us.

First. Apply the etching ground to your sheets.

Second. Etch in the usual manner, with iron perchloride solution modified with chlorate of soda, or the usual combinations you have previously used in etching brass.

Third. When the etching has been completed, bright acid dip the sheets in a mixture of equal parts of sulphuric acid and nitric acid. To every gallon of mixed acids add one pint of cold water and a half ounce of muriatic acid. The immersion of the plates in the bright dip should be only for a second or two to give a bright surface to the etched ground of the plates. Wash thoroughly in cold water and then immerse and cyanide dip to remove any acid stains. The cyanide dip is composed as follows:

Water	1 gallon
Sodium cyanide	4 ounces

Fourth. From the cyanide dip wash in cold water and immerse in the silver dip until a white silver color is produced. This will require about 5 to 10 seconds.

Silver dip:

Water	1 gallon
Sodium cyanide	2 ounces
Silver cyanide	¼ to ⅜ ounce
Caustic soda	⅛ ounce

Fifth. Dry the plates after washing in clean water and then remove the etching ground with benzine or gasoline. See that the exposed brass letters are clean and bright. If necessary, make use of the cyanide dip to remove any oxide or stain. Then immerse in the black oxidizing solution to change the brass letters to black.

The oxidizing solution is prepared as follows:

No. 1:

Water, temperature 120° Fahr	2 gallons
Carbonate of soda	8 ounces

No. 2:

Aqua ammonia, 26%	1 quart
Dry carbonate of copper	10 ounces

Prepare No. 1 and No. 2 separately and mix together.

The brass part of the plate will become black in a few minutes. Rewash in cold water. Dry and lacquer the plates. The black dip has no action upon the silver coating.—C. H. P. Problem 2,851.

METAL POLISH

Q.—Will you kindly send me a recipe for polishing copper, brass, nickel, etc., by hand? We have been using a liquid metal polish for cleaning our polishing-room windows, but we cannot obtain this particular kind for readily removing the oxides of iron, etc., which always accumulate.

A.—We have no idea of the composition of the liquid polish you have been using that readily removed the oxides formed upon your polishing-room windows. We presume it contained oxalic acid. But why use polish to remove the oxide when a rubber glove, a sponge and a mixture of equal parts of muriatic acid and water will reduce the oxide in an instant? Then you can remove the excess of acid with water and polish with whiting and water or wood alcohol and finish with a dry cloth.

Gasoline	1 pint
Barium carbonate	4 ounces
Yellow rosin	½ ounce
Oxalic acid	¼ ounce
Oleic acid*	½ ounce

*This is commonly termed red oil.

This polish will give good results on all metals, such as copper, bronze, brass, nickel and silver and presumably your polishing-room windows.—C. H. P. Problem 2,852.

POLISHING DIE CASTINGS

Q.—What is the best method of polishing die castings?

A.—Die-castings ordinarily should come without pit-holes. When they do come with pit-holes, the best method to follow is to polish with a rag wheel set up with No. 150 emery. This is to be used dry. Then polish with a rag wheel set up with No. 180 emery. This wheel is used with grease; buff and color.

However, when the die-castings show nothing else but mold marks, polish directly with the No. 180 grease wheel; buff and color.—J. H. Problem 2,853.

WATCH JEWELS

Q.—I would like to know how the hole jewel is made for watches.

A.—In regard to making hole jewels for watches, you require a watchmaker's lathe, equipped with a taper chuck and several brass tapers, to fit, an arbor chuck and assorted sizes of wire chucks, although the wire chucks are not absolutely necessary in making hole jewels. You will also require a diamond drill, a diamond cutter and a diamond slitting saw. An alcohol lamp, some gum shellac and an assortment of brass wire and pegwood practically complete the outfit.

To make the diamond saw, we should have a pair of collars truly made to fit the arbor chuck. The collars may be about an inch in diameter. Then a thin disc of soft steel about two inches in diameter should be turned up to fit between the collars. The disc should be about 1/32 of an inch in thickness. The disc, when complete, should be charged with No. 1 diamond powder, which may be easily done by using a hardened steel roller and rolling the diamond powder into the edge of the disc while the lathe is revolving at slow speed. A small amount of diamond powder and oil should be applied at a time and thoroughly rubbed into the disc until properly charged. We now have a diamond saw suitable for cutting the rough stones into thin slabs, which is the first step in jewel making. The pebble should be cemented onto the end of a stick with gum shellac and presented to the edge of the saw, which should be supplied with running water during the slitting operation. After slitting the pebble, the slabs should be cut with the diamond cutter into small squares of suitable size from which to make the jewels. The corners of these squares may be nipped off with a pair of cutting pliers to a rough circle.

Our next step will be to cement one of the squares to the end of a brass taper with shellac, truing it in the round and flat while the shellac is plastic. A diamond turning tool may be used for turning the edge of the jewel to the required size and also for centering the hole previous to drilling; then the drill (which should be set in the end of a brass wire) should be presented to the center thus formed and the hole drilled partly through. The jewel should then be reversed on the taper and trued carefully and the other half of the hole drilled through. Before you remove the jewel from the taper, the convex surface of the outside of the jewel, and also the oilcup, should be formed with the diamond turning tool. A piece of copper wire should be formed on the end to conform to the shape of the convex surface of the jewel, also another piece of copper wire should be made to conform with the oilcup. By applying a small amount of No. 3 diamond powder these surfaces may be quickly smoothed. The final polishing can be done with No. 5 diamond powder applied to the boxwood points, formed in the same manner as the copper wire. The jewel can next be removed from the taper and the shellac completely removed with alcohol. Then the flat surface of the jewel can be polished by holding the jewel against the surface of a boxwood lap to which a small amount of No. 3 diamond powder has been applied. The final finish is produced with No. 5 diamond powder.

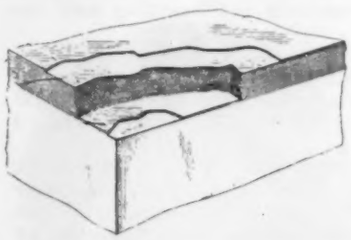
To open and polish the hole the jewel should be held in an auxiliary brass chuck or taper. A soft steel wire, slightly tapered, is charged with No. 3 diamond powder by rolling between two hardened flat steel plates. Then the taper should be dipped in oil and gradually worked into the hole until the required size is obtained. The final polishing is done with No. 5 diamond powder applied to the end of a tapered peg of boxwood.—J. C. Problem 2,854.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,332,674. March 2, 1920. **Process of Manufacture of Plates and Large Sheets of Composite or Compound Metal.** Edouard Martin, of Brussels, Belgium, assignor to Compagnie Belge du Bimital, Société Anonyme of Brussels, Belgium, a corporation of Belgium.

This invention has for its object the manufacture of plates and large sheets composed of composite or compound metal by the rolling out of thick ingots or blocks (of from 100 to 250 mm. in thickness and more) of composite or compound metal, such as steel and copper, steel and brass, etc., while preserving the initial proportions of these two metals. The present method consists broadly in subdividing the plate of copper or of brass into sheets of such thinness that by superposing them a supple metallic block is obtained. The thinner these sheets are, the more regularly does the rolling take place without projection of the copper or the brass in the hydraulic press or during rolling.



1,333,237. March 6, 1920. **Industrial Product Comprising a Soldering Substance for Aluminum with Process for Obtaining It.** Angel Mirete Ayala, of Madrid, Spain.

The present invention relates to a method of manufacturing solder and to the new article of manufacture which is not only much stronger than solders previously known, but which is comparatively inexpensive, as regards both manufacture and ingredients.

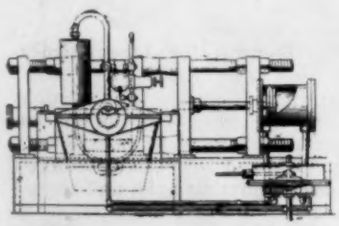
This new soldering substance is composed essentially of zinc, tin and lead in proportions which may vary according to the results to be obtained.

Extreme limits of the components are as follows:

Zinc	from 20 to 70 per cent.
Tin	from 15 to 60 per cent.
Lead	from 10 to 50 per cent.

1,332,940. March 9, 1920. **Die-Casting Machine.** Alfred H. Wiedhofft, Chicago, Ill., assignor of one-half to Charles Soderholm, Chicago, Ill.

One of the primary objects of the present invention is to provide an automatic control for the various operating elements of the machine which will cause them to be positively operated with absolute accuracy in requisite predetermined timed relation. By automatically controlling the operation of the machine its speed over a manually-controlled machine may be greatly increased, and all dangers of breakage or injury to the machine resulting from improper timing or inaccurate sequence of operations is entirely obviated.



1,332,899. March 9, 1920. **Solder for Metals,** particularly Aluminium. Ragner Iversen, Christiania, Norway.

The object of the present invention is a composition of metals or an alloy which is specially fit for soldering parts or pieces of aluminium, but can also be employed in soldering other metals.

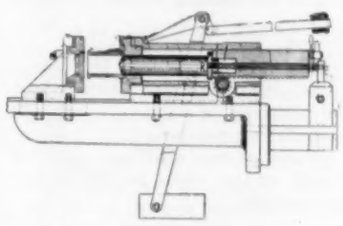
The novel means for soldering has the following composition: tin, zinc, copper, aluminium and manganese. These substances are melted together and formed into ingots or bars.

A suitable proportion is the following:

41.000 kg	tin
27.750 "	zinc
3.000 "	copper
0.100 "	aluminium.
0.600 "	manganese

1,332,975. March 9, 1920. **Babbitting-Machine.** August F. Donaldson, Toledo, Ohio, assignor to the Bunting Brass and Bronze Company, Toledo, Ohio, a corporation of Ohio.

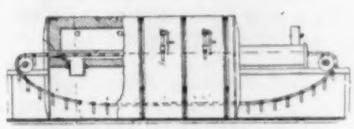
This invention has for its object to provide in connection with a babbitting-machine, a means whereby the babbitt metal may be cooled at a certain definite rate to insure cohesion of the metal with the bushing and to regulate the metal flow to obviate the effects of metal contraction due to cooling and withdrawal from the hot babbitted bushing.



The invention may be contained in structures of different forms. To illustrate constructions containing this invention, one of such structures has been selected and is illustrated in the accompanying drawing.

1,333,371. March 9, 1920. **Conveyor for Furnaces.** Clarence D. Barnhart, Brooklyn, N. Y., assignor to W. S. Rockwell Company, New York, N. Y., a corporation of New Jersey.

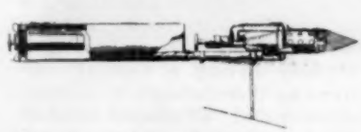
This invention relates to a continuous automatic furnace in which the material or stock to be treated is placed in pans which are pivoted upon crossbars connecting two chains, which chains carry the pans automatically through the furnace at any predetermined speed, and discharge them automatically at the end of the required treatment. Where the articles require hardening they are discharged into a tank of water, oil or other quenching liquid and their treatment is thus effected in a single continuous operation.



1,333,590. March 9, 1920. **Self-Heating Soldering Iron.** Claude M. Padgett, Chicago, Ill., assignor of one-half to Vivian Dick Tennyson, Chicago, Ill.

This invention relates to soldering tools which are self-heated, a liquid fuel burner being provided which is a part of the tool.

The invention has for its object to provide a simple, efficient and economical tool of the kind stated.



The tool is simple and compact in construction, and also economical in fuel consumption, as the fuel is completely vaporized in its passage through pipes, the same therefore serving as a retort. The tube or pipe is kept very hot as it is integral with the mixing tube or chamber.

1,333,616. March 16, 1920. **Soldering Iron Holder.** Chris. S. Hall and Freeman D. Smith, Dyersburg, Tenn.

An iron support including a base, a circular supporting member secured to the base adjacent one end thereof, a supporting member to the base adjacent the opposite end thereof, an insulating ring supported by the circular supporting member, and an insulating plate secured to the base.

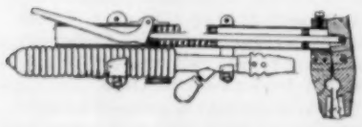
1,333,619. March 16, 1920. **Solder.** Charles W. Hill, Edgewood, Pa., assignor to Westinghouse Electric and Manufacturing Co., a corporation of Pennsylvania.

A solder comprising a small but appreciable amount of zinc

together with lead and cadmium in substantially the proportions of 6% to 10% cadmium and 94% to 90% lead.

1,332,937. March 9, 1920. **Soldering-Iron.** Jacob Hendrik Van Viersen, of The Hague, Netherlands.

The purpose of the present invention is to join wires by means of a soldering-iron of improved construction. The head of this iron consists of two or more parts which together form a pair of jaws adapted to be closed for forming the junction. Though not necessary, it is efficient to heat the head, which is composed of a number of movably connected parts by means of a narrow benzine flame in the manner known for ordinary soldering irons.



1,333,621. March 16, 1920. **Flash Mold.** Willard H. Kempton, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company, a corporation of Pennsylvania.

A mold comprising two co-operating portions having overlapping flanges arranged to permit excess molding material to escape therebetween, the flange of the lower portion being spaced about that of the upper portion.

1,333,629. March 16, 1920. **Metal Melting Furnace.** George C. Rahn, Erie, Pa.

In a metal melting furnace, the combination of a tilting metal furnace chamber; a crucible support projecting upwardly from the bottom of the furnace comprising a metal post; and positive means for cooling the post.

1,333,666. March 16, 1920. **Solder.** George P. Luckey, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company, a corporation of Pennsylvania.

A solder comprising alloy of lead and cadmium containing substantially 90% to 94% lead and 10% to 6% cadmium.

1,333,706. March 16, 1920. **Acid-Resisting Alloy.** Alvah W. Clement, Cleveland, Ohio, assignor to The Cleveland Brass Manufacturing Company, Cleveland, Ohio.

An acid resisting metal alloy comprising substantially 60% of chromium and substantially 39 7/10 to 39 2/10% of iron and substantially 3/10 to 8/10% of carbon, the carbon being present as a carbide of chromium and iron.

1,333,751. March 16, 1920. **Metal Bending Machine.** Charles Decrette, New York, N. Y.

A metal bending machine comprising a base, a hollow standard mounted upon said base, a fixed arm having a longitudinal guideway therein secured to said standard, a vertical shaft extending through said standard and having a movable arm attached thereto, said movable arm having a longitudinal guideway therein, adjusting blocks slidably mounted in each of said guideways and each comprising a substantially "T" shaped member having a vertical substantially central channel extending therethrough, a substantially "L" shaped member adjacent said "T" shaped member and having a hole through the base thereof under the lower end of said channel, a screw passing through said channel and said hole so as to tie said "L" shaped member and said "T" shaped member together, an adjusting screw mounted in the vertical arm of said "L" shaped member and having its tip contacting with said "T" shaped member.

1,333,754. March 16, 1920. **Art of Die-Casting.** Charles M. Grey, East Orange, N. J.

In the art of die casting, the method of charging the pressure pot which consists in pneumatically raising the level of a portion of the bath in which the pressure pot is supported above the normal level of the bath and by such change of level causing the metal to flow into the pressure pot.

1,333,914. March 16, 1920. **Electric Furnace and Method of Operation.** Louis C. H. Groeger, Chicago, Ill.

In an electric furnace, the combination of a heating chamber having a hearth terminal, a plurality of co-acting side electrodes extending toward each other from the sides of the furnace, and so disposed above the bath as to enable an arc to be established directly between their inner ends, said electrodes being tiltable, adjusting means adapted to vary the tilt of said electrodes, the means whereby circuits may be established with an arc directly between the electrodes or with an arc between the electrodes and the bath with the circuit completed through the hearth terminal.

1,333,965. March 16, 1920. **Alloy.** Frank A. Fahrenwald, Cleveland, Ohio.

An alloy which is stronger, harder and lighter than aluminum, consisting of aluminum and less than sixty-five per cent beryllium.

1,333,971. March 16, 1920. **Molding-Flask.** Julius M. Germanson, Milwaukee, Wis., assignor of one-half to Milwaukee Steel Foundry Company, Milwaukee, Wis., a corporation of Wisconsin.

In a molding flask, the combination with the mold sections, of brackets secured to the ends of the sections, an upwardly projecting short pin formed on the top surface of each bracket, means on the bottom surface of each bracket for engagement with the pins of brackets on a lower member, and removable guide members carried by the upper brackets and engageable with the lower brackets, said guide members being of a length equal to the combined width of the upper and lower brackets.

1,334,029. March 16, 1920. **Casting Mold.** Frederick Hachmann, St. Louis, Mo., assignor, by mesne assignments, to National Metal Die Mold Company, St. Louis, Mo., a corporation of Missouri.

A casting mold, comprising a mold body having a cavity adapted to form a casting, containers adapted to contain a lubricant that will be converted to volatile carbonaceous matter by the heat of the mold, and passages for conducting the volatile carbonaceous matter to the wall of the mold cavity.

1,334,030. March 16, 1920. **Casting Mold.** Frederick Hachmann, St. Louis, Mo., assignor, by mesne assignments, to National Die Mold Company, St. Louis, Mo., a corporation of Missouri.

A casting mold composed of separable sections of lithic material arranged in side by side and superimposed relation and forming a mold cavity between them adapted to form a casting and having an open upper end, means for holding the sections of lithic material in side by side and superimposed relation and a passage opening into the bottom of the mold cavity through one of the walls thereof, for delivering molten material into the bottom of the cavity.

1,334,036. March 16, 1920. **Hot-top for Ingot Molds.** John Jones, Philadelphia, Pa.

The combination of an ingot mold, a hot top for said mold and including a pouring hole communicating with the interior of the mold whereby the molten metal can be poured into said mold through the pouring hole and so that a portion of the molten metal can remain in the pouring hole; and means for holding said hot top to normally prevent the latter from moving toward the ingot mold, said latter means including a part movable to permit the hot top to gradually move toward the mold during the shrinking of the metal while in a molten state, said part also serving to prevent the hot top from falling unchecked toward said mold; substantially as described.

1,334,809. March 16, 1920. **Electric Resistance Furnace.** Jules Simon and Paul Francois Sarron, Lyons, France.

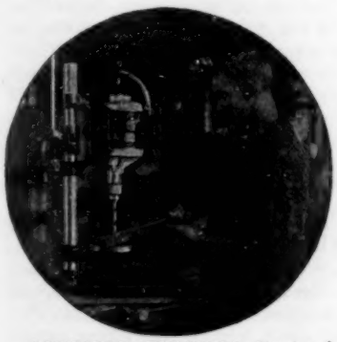
In an apparatus for the purpose set forth the combination of a furnace chamber, a gas heating chamber having a gas inlet, a twyer connecting said gas heating chamber to said furnace chamber, tubes of cast quartz in said gas heating chamber in the path of the gas between said inlet and said twyer, a pulverulent electric resistance increasting said tubes and composed of carborundum and graphite, and electrodes for passing electric current through said resistance.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

ELECTRIC DRILLS FOR SHEET METAL WORK

In many progressive sheet metal factories a portable electric drill does the work ordinarily assigned to a hand punch. Where it is convenient to carry the sheet metal to the drill a bench drilling stand is used similar to the illustration, a product of the drill manufacturers, The Van Dorn Electric Tool Company of Cleveland, Ohio. Where it is more convenient to carry the drill to the work it is detached from the stand and used like any portable electric drill.



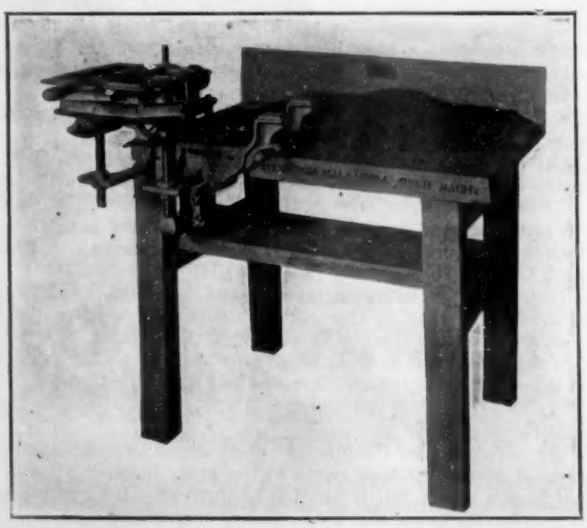
PORTABLE ELECTRIC DRILL.

As a portable tool its uses are said to be very numerous. Whether for light or heavy gauge sheet metal, steel or iron, castings or wood, wherever holes were needed, a hurry-up call goes out for one of these handy tools and in one case it was stated that a drill had paid for itself in the first week of use.

The manufacturers claim that among unique applications of the drill are suspension on traveling runways and radial arms, air and hydraulic feed, and in one case, by using a special chuck, drills are even used for tightening bolts on harvester frames.

NEW CORE MACHINE

The machine can be bolted on any core bench; the capacity of the cradle is to take any core box measuring up to 12 x 18"—6" draw; it can be operated by unskilled laborers, due to its extreme simplicity. The operator's movements are practically automatic because the machine is so designed that the operator stands in one position throughout the entire operation. From his bench he throws the sand into the core box, jolts by hand, strikes off, pulls down a clamping device, throws the cradle a quarter turn,



CORE MACHINE BOLTED TO BENCH.

and the plate is landed. He then pushes a button, starts the vibrator, presses down on the lever until it automatically locks. His core is drawn.

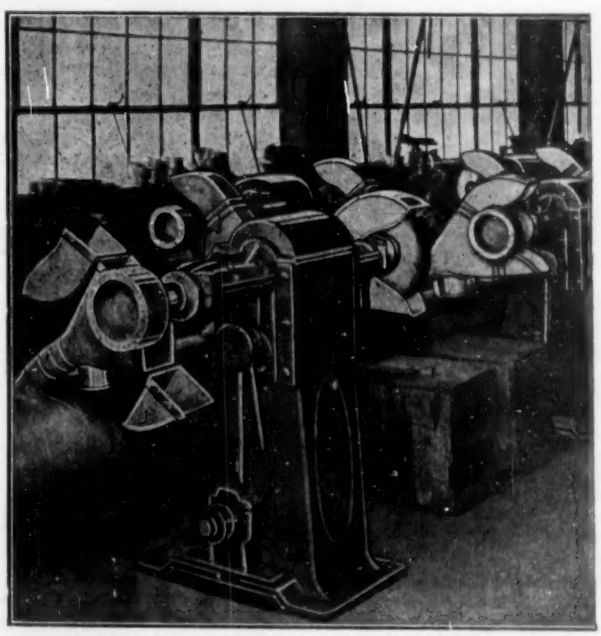
The Woodison engineers have also designed another core machine for use on split core boxes. This machine will draw any split core box up to 8"; length and width unlimited. The magnets placed horizontally against pads on the outside of the core box vibrate, and drawn at the same time; while another magnet holds the core plate firm.

In designing this machine, it was built with knee pads on both sides to enable two operators to use one machine. While one is ramming the core box, the other operator draws. The machine is built by the E. J. Woodison Company, Detroit, Mich.

NEW POLISHING AND BUFFING MACHINE

This machine embodies many new features. The rigid housing, upon which are mounted two separate spindle bearings which are vertically raised and lowered by eccentrics and firmly clamped to the housing by the use of special clamp nuts operated with handles shown on each side of housing. By this means the loose connected belts are brought in contact with the lower revolving pulley at the required adjusted belt tension.

Spindles can be stopped and started instantaneously without the use of shifters, frictions or electric devices, thereby eliminating overhead oil soaked, dust carrying belts, troublesome loose pulleys, or direct connected motor drive difficulties.



A BATTERY OF BUFFING AND POLISHING MACHINES.

When the machine is not in use there are no revolving idling belts or pulleys to consume power for the reason that the belts on this machine hang loose around the lower revolving pulley with about one-half inch or more clearance. By raising the spindle bearing the desired belt tension is obtained and maintained by the adjustable stop which is slightly raised as the belt stretches. The manufacturers recommend a light, double high grade belt glued endless.

To stop the wheels, lower the spindle bearing, the spindle pulley will then rest on a friction block in the housing, stopping instantaneously, by the use of the eccentric the spindle can be clamped to prevent same from turning when removing the polishing wheels, thereby securing a snug fit which is desired by experienced polishers.

The spindle bearings consist of two double and two single rows high grade ball bearings enclosed with double felt washers making them entirely dust proof. The bearings can be replaced.

This machine, which can be installed on any floor, is made by the Excelsior Tool and Machine Company, East St. Louis, Ill.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

FOUNDRYMEN'S EXHIBIT

In a bulletin to exhibitors just issued by C. E. Hoyt, secretary of the American Foundrymen's Association, the encouraging information is given that exhibit space in excess of 51,000 square feet has already been contracted for, with 85 of last year's exhibitors yet to be heard from. This advance space reservation is within 9,000 square feet of the total space used at the Philadelphia exhibit last year and indicates beyond all question of doubt that the Columbus Convention and Exhibit will be the greatest in the history of the association.

Quite a number of new exhibitors will be on hand this year especially along the general shop equipment and machine tool lines as there is a growing appreciation of the extraordinary purchasing power represented in the A. F. A. attendance, aside from strictly foundry requirements. This is due to the fact that a good share of the men interested in the foundry meetings also operate machine shops.

A striking feature of these annual foundrymen shows is the large percentage of operating exhibits demonstrating the equipment by duplicating actual working conditions. Last year more than 50 per cent of the 208 exhibitors used power, 170 motors being in operation and 31 exhibitors using compressed air for demonstrating purposes. With the increased space available this year at the Ohio State Fair Grounds, where both convention sessions and equipment exhibits will be held, the number and size of operating exhibits will undoubtedly far exceed any previous year.

CONVENTION DATES FAVOR CO-OPERATION

This year the annual Convention and Exhibit of the American Foundrymen's Association will be held in Columbus during the second week following the annual Convention of the American Steel Treaters' Society in Philadelphia. This will permit attendance at both meetings on the part of the many men who are interested in both organizations.

A consolidated car shipment direct from the Philadelphia exhibit to the Ohio State Fair Grounds in Columbus will also permit exhibitors to display and demonstrate their products at both gatherings.

The Convention date of the Steel Treaters' Society is September 14-18, while the foundrymen convene the week of October 4.

A. F. A. OUT FOR NEW MEMBERS

Plans for an aggressive campaign for new members have been formulated by the 1920 Promotion and Membership Committee of the American Foundrymen's Association. The campaign will be handled from the Association Headquarters Office in Chicago, and covers three months, culminating in a special "Foundrymen's Week" during September and the annual convention in Columbus, Ohio, the week of October 4.

A. E. Howell, of the Phillips & Buttorff Manufacturing Company, Nashville, Tennessee, is chairman of this committee. The campaign will be handled from the Association Headquarters Office in Chicago, and covers three months, culminating in a special "Foundrymen's Week" during September and the annual convention in Columbus, Ohio, the week of October 4.

NEW YORK BRANCH, A. E. S.

New York Branch of the American Electro Plater's Society meets every 2nd and 4th Fridays of each month at the Broadway Central Hotel Parlors, New York, N. Y. Secretary, John Burke, 110 Glen street, Brooklyn, N. Y.

President J. E. Sterling presided at the June meetings of the New York Branch of the A. E. S. Two applications for active membership were received and referred to the Board of Trustees. Past President T. B. Haddow installed the newly elected officers of the New York Branch.

The main topics under discussion were the Resolutions and Amendments to be submitted at the A. E. S. Annual Conventions in Rochester, N. Y., July 1, 2, 3, 1920. Secretary J. Burke read a communication received from the U. S. Bureau of Standards, notifying the New York Branch that their request was complied with. The following resolution adopted by the New York Branch was presented to the President of the United States:

Be it resolved by the New York Branch of the American Electro Platers' Society that we respectfully urge that the units of the Metric system be adopted by Congress of the United States of America and the British Parliament as the exclusive legal standards of Weights and Measurements, and be it further resolved that copies of this resolution be forwarded to the President of the United States of America (through the Bureau of Standards, Department of Commerce) and to the British Premier (through the Board of Trade) and all other legislatures concerned. Voted unanimously by the New York Branch of the American Electro Platers' Society, one of the leading bodies in the Electroplating industry at the City of New York, May 28th, 1920.

(Signed) JOHN E. STERLING, President.

BRASS MANUFACTURERS

The National Association of Brass Manufacturers held one of the most successful Summer meetings it has ever held in the City of Cleveland last week, at which a most interesting report was tendered by the Water Works Division of the Committee on Standardization, delegates having been sent to the International Convention of the American Water Works Association held at Montreal, and a great variety of useless sizes and types of water works, brass goods, corporation cocks and service fixtures were done away with as well as the standardization of those retained. This report was handed in in detail and is withheld for the time being pending the final confirmation of the Conference Committee of that organization.

It will be of interest to manufacturers as well as jobbers to know that the Association adopted one-fourth-inch O. D., 28 thread for all waste tubes that will hereafter be used on all kinds of stop and waste cocks. Also a standard diameter for pop-up waste plugs only, of one and one-half inches outside diameter on threaded shank.

It also passed upon the charts of full waterway compression stops, which will be published and form a part in our book of standardization.

They decided to retain the words "Hot" and "Cold" on all china scalp and china handles for all types and styles of fixtures, and also appointed a committee to co-operate with the potters, looking to the uniformity of styles, sizes and standardization of all china parts pertaining to plumbing fixtures.

On Quick Opening Work it made quite a decided departure in passing the following order:

On all upright or top handle Quick Opening Compression Work (except Bath Cocks), the handles will stand parallel with the spout when closed and turn to the right when open, the right meaning to the right hand of the party operating the fixture.

Elected to membership Thomas J. Nichol & Company, of Cincinnati, Ohio.

It reviewed wage increases, material and coal costs and letters read showed that coal is now costing almost double what it did a year or more ago—then cost $4.00, now $3.75 more, or $7.75, with a freight rate of 80 cents which with the new award to railroad labor will be materially increased and with an added cost of 25 cents to 30 cents for unloading, will bring the coal cost in the neighborhood of $9.00 per ton.

It did not concur in the printed report issued by the National Bureau of Standardization owing to the many inaccuracies contained in this report, but referred it to their affiliated committee with instructions to see that the necessary corrections were made.

The Commissioner reported the finances of the Association in a healthy condition and numerically it is stronger now than it has ever been before.

He further reported that owing to labor troubles in the printing line and delay in securing paper, the official catalog has been held up, but will now be completed and it is hoped by the tenth or fifteenth of August, to have all orders filled.

After a three day session of the various divisions of this Association, they adjourned to meet next in New York City on December 8th and 9th, 1920.

BRITISH INSTITUTE OF METALS

AUTUMN MEETING, BARROW-IN-FURNESS, SEPTEMBER 15-16.

The Council are now pleased to be able to give further particulars of the previously announced Annual Autumn Meeting, which, thanks to the courteous invitation of the mayor and corporation of Barrow-in-Furness, will take place in Barrow on Wednesday and Thursday, September 15 and 16.

Members will assemble at Barrow on September 14, during the afternoon of which day the honorary local secretary's office, at the Town Hall, will be open for the distribution of papers and cards. On September 15 at 10 a. m. an official welcome by the Mayor, in the Town Hall, will be extended to the members, and the rest of the morning will be devoted to the reading and discussion of papers. After luncheon an excursion to a place of interest will be made, and in the evening there will be a mayoral reception in the Town Hall.

On September 16 the morning will be devoted to the reading and discussion of papers, and after luncheon there will be visits to works, including those of Messrs. Vickers, Limited, the Barrow Hematite Steel Works, the Barrow Paper Mills, Hodbarrow Mines, Millom & Askam Hematite Iron Works, North Lonsdale Iron and Steel Company, and the Furness Railway.

BALLOT ON SEPTEMBER 1.

For the convenience of applicants for membership who are desirous of being elected in time for the Barrow meeting a special ballot is being taken at noon on Wednesday, September 1. It is hoped that members will be good enough to bring this notification to the knowledge of those who may be desirous of applying for membership of the institute.

AMERICAN ENGINEERING SOCIETIES

At the Annual meeting of the American Institute of Chemical Engineers held in Montreal, June 28-29, 1920, the question of the Institute becoming a member of the Federated American Engineering Societies was favorably discussed and referred to the Council for consideration at its meeting on July 25, at which time definite action will be taken. In the discussion the opinion was expressed that the Institute should be a member of this organization and if its finances would not permit this, that members should be assessed the necessary amount.

The report of the delegates to the Washington Organizing Conference was read at the meeting of the Board of Directors of the American Institute of Electrical Engineers at the Annual Convention at White Sulphur Springs, W. Va., June 30 and the following resolution adopted:

"Resolved, that it is the sense of this Board that the A. I. E. E. should join The Federated American Engineering Societies, but that as there is a small attendance at this meeting and a new Board will be constituted, commencing with the administrative year on August 1, action be deferred until the August meeting of the Board and that a letter be sent the members of the Incoming Board, with a request that they give careful consideration to the matter and be prepared to act at the next meeting."

The report of the delegates to the Washington Organizing Conference was read at the meeting of the Board of Directors of the American Institute of Mining and Metallurgical Engineers on June 25, was favorably discussed and referred to the Finance Committee to devise and report on means of meeting the financial requirements.

The report of the delegates to the Washington Conference representing the American Society of Civil Engineers will be presented at the Annual Convention of the Society, at Portland, Oregon, August 10-13, 1920.

EXPOSITION OF CHEMICAL INDUSTRIES

Returning to New York City after an absence of a year—last year's exposition was held in Chicago—the Sixth National Chemical Exposition of Chemical Industries will open in Grand Central Palace, September 20 and continue until September 25, inclusive. The expansion in the industry, as shown by the increased number of exhibitors, necessitates the use of four floors in the Palace, and Charles F. Roth and Fred W. Payne, managers of the show, continue to receive applications for space almost daily, so great is the interest in the exposition.

Two new sections will feature the exposition this year. These are the Fuel Economy Section and the Materials Handling Section. Fuel Economy section will embrace exhibits of machinery and apparatus, furnaces, producers, stokers and all devices for the economic utilization or more efficient combustion of fuel. The constantly mounting cost of fuel as well as its increasing scarcity makes enlightenment on these vital subjects necessary.

In the Material Handling Section will be a series of exhibits showing machinery and equipment for the handling of material such as: conveying, transporting, elevating, and included will be weighing, measuring and power transmission equipment.

The committee in charge of the exposition includes: Charles H. Herty, editor **Journal of Industrial and Engineering Chemistry,** chairman; Raymond F. Bacon, director, Mellon Institute; L. H. Baekeland, member, Naval Consulting Board; Henry B. Faber, consulting chemist; Ellwood Hendricks, president, The Chemists' Club; Benhard C. Hesse, General Chemical Co.; W. S. Sandis, president American Electrochemical Society; A. D. Little, president Arthur D. Little, Inc.; William G. Nichols, chairman board, General Chemical Society; W. A. Noyes, president American Chemical Society; H. C. Parmlee, editor **Chemical and Metallurgical Engineering;** R. P. Perry, vice-president the Barrett Co.; T. B. Wagner, vice-president U. S. Food Products Corp.; David Wesson, president American Institute Chemical Engineers, and M. C. Whittaker, president U. S. Industrial Chemical Co.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

Bushnell Bigelow has been appointed assistant general sales manager and **Walter I. Hess,** manager of eastern sales, of the New Jersey Zinc Company.

J. B. Mendenhall, formerly sales manager of the Lewin Metal Corporation, St. Louis, Mo., is now sales manager and purchasing agent for the Shreveport Brass Works, Inc., Shreveport, La.

Frank E. Lamson, who has been in charge of the shipping and receiving departments of the Sessions Foundry Company, Bristol, Conn., for many years, has been made asistant to President William E. Sessions.

W. S. Quigley, president of the Quigley Furnace Specialties Company, sailed for France on board the Cunard liner **Imperator** on July 15. His trip is for the purpose of furthering the business relations of the Quigley organization in England, France, Belgium, Italy and Spain.

Dr. J. H. Andrew, chief of metallurgical research department of Sir. W. G. Armstrong, Whitworth & Company, Openshaw, Manchester, England, has been appointed to the chair of metallurgy in the Royal Technical College, Glasgow, Scotland, left vacant by the transfer of Dr. Desch to the University of Sheffield.

W. A. Toohill has been appointed sales representative for the Dayton, Ohio, territory for the Quigley Furnace Specialties Company (Metals Division), manufacturers of Q-Steel and Q-Alloy pots and boxes. Mr. Toohill was for some years metallographer with the International Motors Company at Plainfield and New Brunswick, N. J.

A. H. Mitchel and **E. R. Abbott,** formerly with H. W. Cotton, Inc., have become associated with the Coe-Stapley Corporation, West Haven, Conn. They are making their headquarters at 136 Liberty street, New York, and will be in charge of the contract sales work of the company, covering quantity production of sheet metal products, stamped, drawn or pierced work, or sheet metal specialties, completely assembled, of any metal and any finish.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

AUGUST 2, 1920.

Although a stubborn element of the New England Workers' association is still out, the long drawn out strike of the skilled and unskilled brass workers of this city has been unofficially declared at an end, after three months.

The crisis was reached when an 18-year-old striker was killed, and two officers of the local police department were seriously injured in a riot in which hundreds of strikers had a part. A score of policemen received minor injuries from flying rocks and other missiles. Public opinion, as evidenced by the efforts of a citizen committee which asked to be relieved after a thorough investigation of conditions, was probably equally divided prior to the fatal riot. Following the shooting of two of the city's best known police officers, however, a wave of condemnation set in, and interest in the cause of the strikers waned rapidly.

The riot itself appeared to be the signal for other outrages, being followed within a few days by the bombing of the home of a non-striker and his family. On top of this a plot to bomb the home of the superintendent of police was nipped in the bud by the discovery of a bomb large enough to destroy a city block. The huge bomb was found in a strip of woods near the home of the police official, and one of two Italian strikers who were arrested in connection with the finding of the bomb confessed that it was intended for that purpose. The two men are being held in the county jail under default of $50,000 bonds.

So tense was the situation immediately following the riot that the State Guard companies organized in Waterbury were called out at once, by previous arrangement with Governor Marcus H. Holcomb. Superintendent of police, George M. Beach, followed the action of the mayor by denying the strikers the right to hold any further meetings, believing that the riot was the result of inflammatory speeches of outside strike leaders.

A slackening of the enthusiasm of the more reliable element of the striking brass workers followed so rapidly on the heels of the riot and other outrages, and the men themselves began to return to the factories of their own accord and in such large numbers that the Scovill Manufacturing company, which had been hardest hit by the strike, advertised, in the local newspapers, to the effect that after July 7 strikers returning would be considered as new applicants for positions.

However, the strike, according to the leaders, was still "on," and it was not until July 17, after a period of six days during which over 2,000 strikers were reported to have returned to their jobs, that the strike leaders gave permission for the men to return. The strike then came to an abrupt end, even though unofficially. A few days later both the local branches of the American Federation of Labor, and the New England Workers' association, declared that strike benefits would no longer be paid. The strike is virtually at an end, and the factories are getting back to a normal basis as rapidly as possible. It must be remembered that a considerable number among the strikers sought work in other cities, a not inconsiderable number having left Waterbury each week during the three months the strike was in progress. Available labor has thus been depleted and it is admitted by factory heads that even with the cessation of strike activities, it will be some months until Waterbury industry is once again on an entirely normal basis.

Just what attitude would be taken by the employers towards the returning strikers caused not a little newspaper comment, especially after some of them accused the employers of discriminating against the men who were known to have assisted in the organization and leadership of the strike contingent. Following a meeting of the foremen's association of the Scovill Manufacturing company, which was addressed by General Manager John H. Goss, the following points, in memorandum form, were presented with reference to the policy of the company:

1. Since April 20th no employee's name has been crossed off the pay-roll because of absence from work, and "our gates have been open to our people."

2. Let us keep down feelings of bitterness or resentment toward the employees who have gone out during the strike.

3. Let us not judge them by what they have done, but by what they do after they return.

4. If, when they return, their old jobs are not open for them, let us use our personal efforts to locate new jobs for them, based, as far as possible in each case, on what we know or believe them capable and able to do.

5. In these efforts let us use patience and tact. If, under the conditions, they accept, we have both succeeded. If, on the other hand, they do not accept, they rather than we have failed.

6. An honest day's work, freely given and fairly judged is a test for permanent employment in this organization, as well as a test for promotion and improved emolument.

7. Our employees and the public will believe the attitude and character of our company to be the same as exemplified by our foremen.

STRIKE A DESPERATE DRIVE BY A. F. OF L.

The Waterbury strike has been dubbed, from one quarter, as a desperate drive to organize the city in affiliation with the American Federation of Labor. Since its defeat in 1902 the federation has tried in vain, until about a year ago, to get a new foothold in this "typically 'open shop' New England city."

It is said that the leaders thought that this year would be a good time, and the labor leaders succeeded in precipitating the strike against the wishes of the men themselves. Later, when the strike of the unskilled workers showed signs of disintegrating, the machinists were called out to strengthen the cause. It will be remembered that the majority of the men on strike were affiliated with the New England Workers' association, a local labor organization with plans to include all New England, eventually. Careful students of the situation, however, are of the opinion that the American Federation hoped, sooner or later, to dominate the local labor organization, and thereby gain the power in this city which it has yet to control.

WHY MANUFACTURERS RESISTED.

Foremost among the manufacturers' reasons for resisting the strike was that any concessions to the strikers would unsettle the whole situation by convincing the strikers that they could force further concessions by further strikes. They were also determined to maintain their open shop policy.

Further the manufacturers contended that present business conditions did not warrant the companies either shortening hours or increasing wages. Careful study of the figures by the Waterbury Chamber of Commerce shows that against an increase in the cost of living of not more than 110 per cent since January, 1915, the present average wage of all labor in Waterbury shows an increase of over 159 per cent for the same period, while unskilled wages have increased 200 per cent. Investigation and search by the police department in the case of scores of unskilled alien workers show that many of them have savings ranging from $600 to $2,000, while most of them adhere to the same standard of living they had three or four years ago.

LAST WEEKS OF STRIKE.

Both materially and otherwise, the strike had its far reaching effects. Extra police protection alone cost the city upwards of $75,000; the calling out of the State Guards cost the state about $1,000 a day for the twenty days they were on duty, and the average loss in wages per day has been variously estimated at from $7,500 to $10,000.

Quarrels among the leaders were too numerous to mention, and the general excitement was stimulated by the suicide of one of the organizers, and statement by him in the public press nearly cost one of the local priests his robe. Even though reports of the strike and the strikers' activities were greatly exaggerated by outside newspapers, the people are relieved that the strike is over.

MISCELLANEOUS NEWS.

Following on the heels of the unsuccessful strikes of the New England Workers association and the American Federation of Labor, Waterbury has been deluged with alleged I. W. W. pamphlets urging the "one big union." The posters and pamphlets are believed to be the work of the more radical element of the strikers

who lost out. Local authorities are conducting an investigation.

Local statisticians are responsible for the statement that the recent strike in this city makes a total of 77 which the A. F. of L. has lost this year. The same source shows that 400 strikes were lost by that organization during 1919.

Additions are to be made to the plant of the **Waterbury Farrell Foundry and Machine Company.** One story will be added to a present four-story building and a new one-story structure 180x47 feet is to be built.

Work has been started on the addition (212x46 feet) to the plant of the **Waterbury Buckle Company,** manufacturers of brass articles of various descriptions.

Greatly increased business is crowding the plant of the **Manville Machine Company** and an architect has been commissioned to draw plans for an addition which will cost approximately $80,000.

The **Berbecker and Rowland Company,** of Waterville, is also planning a three-story addition, 136x40 feet.

Frank B. Noble, secretary of the Chase companies, with whom he was connected for 35 years, died at his home in Watertown on July 2, after a brief illness. He was 55 years old and is survived by three children.

Captain Herbert D. Gallaudet, head of the industrial service department of the **Scoville Manufacturing Company,** will sever his connections with that company on September 1, having accepted a call to become pastor of the First Congregational Church of Waterbury. Rev. Gallaudet was a chaplain with the Yale batteries in 1916, later being commissioned a captain in the field artillery for service in the late war. He is largely responsible for the reputation which the Scoville Company has attained for its progressive policy in taking care of its employees.

BRIDGEPORT, CONN.

AUGUST 2, 1920.

The stoppage of the trolley cars in this city on July 25 has added another itme to the list of worries that the managers of factories in this city have to contend with. Because of the peculiar layout of the streets of the city the business centre is confined to a very small area traversed by narrow streets which radiate from the centre at Main street and Fairfield avenue. The large industrial plants lie in all directions from this centre and practically all trolley cars are routed through this centre. For a number of years the Connecticut company which operates all the trolley lines in the state has provided a very inadequate service and the workmen in the factories have had much difficulty in going to and from their work. During the war it was found necessary to obtain additional traffic facilities and a number of privately owned jitneys began to ply to and from the shops and along the principal thoroughfares. The jitneys were followed by buses carrying about twenty passengers and these increased in numbers so that this year the jitneys and buses carry about 70 per cent of the travelling public each day. The jitneys charge only five cents for a ride, while the trolley company began a year ago to raise the rates; first they went to six cents and afterwards adopted the zone system by which the charges rose to eight, ten and twelve cents for rides within the city limits. The buses gained in patronage and the revenue of the trolley company decreased to such an extent that its officers allege that from June 1 to July 15 they were losing at the rate of $50,000 a month. That is, they were taking in $50,000 less than was necessary to meet the bills for labor and upkeep and they were unable to pay anything for taxes, interest or street repairs. They now owe over $2,000,000 taxes.

The management of the trolley company on July 7 sent notice to the Mayor of Bridgeport that if the competition of the jitneys was not eliminated the trolley cars would stop running in Bridgeport.

The aldermen passed an ordinance forbidding the jitneys to run through the centre of the city, which ordinance the Superior Court found invalid when the matter was brought to their attention through an injunction sued out by the jitneymen against the enforcement of the ordinance.

The following Monday, July 25, the trolley cars stopped running.

The bus association prepared for the event by bringing into the city all available buses they could get and have handled the situation exceedingly well up to date. The factory managers are loud in their praise of the jitneys and say that never in the history of the city have so few of their men been late to work.

The traffic congestion in the centre of the city has been greatly relieved by the stopping of the trolley cars and citizens, particularly those who own their own cars, are demanding that the trolleys, if they resume, be barred from the centre of the city and that only jitney buses be allowed at Main street and Fairfield avenue crossing.

NEW BRITAIN, CONN.

AUGUST 2, 1920.

Business shows no indication of a let-up during the midsummer and with the possible exception of the **Fafnir Bearing Company** and one or two smaller plants, maximum production is the order. Recently there has been occasion to reduce the working force at the **Fafnir Bearing Company,** but this has no special significance. At this plant there is also no longer a night shift. The **New Britain Machine Company,** however, continues to operate its night shift, the production being on its tractor. This farm tractor, which was taken up about a year ago, has not thus far proved itself the success that it was at first and the company is continuing to experiment with indications of turning out a better product when deliveries are started. So far, it is understood, only a small number of the tractors have been shipped out to the trade. Along this line of development and expansion, especially in the tractor industry, comes the announcement that the New Britain Machine Company wishes to increase its capitalization by the issue of one million dollars in additional common stock and a million in preferred. The stockholders will vote on the matter on July 28. If accepted, the capitalization of this concern will be six million dollars common, and three million preferred. Only last April the capitalization was increased from two million common to five million dollars in common and two million in preferred. A statement from the factory says that in the automatic screw and chucking machine departments it is impossible to keep abreast with orders. The output of the regular variety has been for the first six months of the year, greater than for the entire year of 1919. Business over this six months' period shows a net of $315,927.21, after reducting taxes.

The **Stanley Works,** working both a night and day shift in its rolling mill, finds itself handling all the business that the production can stand—and then some. Foreign orders are also receiving considerable attention at this plant and South America, as well as Europe, is on the export list with big orders.

The **American Hardware Corporation,** including the various branches, is plugging along with usual production; but at the **Corbin Screw Corporation** business is even more brisk than it has been. This plant has at least two automatic screw machines which are not duplicated anywhere in the country, and the screw department is very busy. The same condition exists in the speedometer department, which caters to the automobile trade.

The North & Judd Manufacturing Company is said to have a big sum on hand, profits from the past few years, and those on the inside say that with the big business being done, and this surplus, the concern may be expected to do something of interest to stockholders before long.

Landers, Frary & Clark, in both its cutlery and domestic hardware departments, is really rushed. The recently enacted English patent law is said to be of material interest to this concern and within the past month two of its leading officials visited the other side "on business." It was reported that the concern was negotiating for the purchase of a factory in England, they presumably intending to use it as an English branch, but this rumor has been stoutly denied by the officials.

The **North & Judd Company** has already one factory branch at tidewater in New Haven and on July 24 took possession of another New Haven concern, acquired by purchase. This is the **W. and E. T. Fitch Company,** located at 151 East street, New Haven.—H. R. J.

TORRINGTON, CONN.

AUGUST 2, 1920.

The **Hendey Machine Company** has voted to increase its capital stock from $1,200,000 to $1,600,000. It is understood that the company is planning extensive additions to its plant. Property at the end of Fairview avenue, bordering on the tracks of the New Haven road was recently acquired.

By paying premium prices, Torrington manufacturers have been able to secure shipments of coal. No suspension of operations because of fuel shortage has been necessitated and none is anticipated, not in the immediate future anyhow.

The plan of the **Torrington Company** to build a new administration building to house the offices of the **Excelsior Needle, Progressive, Standard and National Sweeper** plants has been deferred. The work will not be attempted until next year at the earliest, it is said.

Labor conditions in this section of the Naugatuck valley are normal.

The newly incorporated **Walker-Stewart Foundry Corporation,** of which **William Stewart,** of Torrington is an incorporator, has leased the building of the **Thomson Drop Forge Company** in Plantsville. The company is capitalized at $50,000 divided into shares at $1,000 each. Other incorporators in addition to Mr. Stewart are Victor E. Walker, Amos Doolittle, John Roach and Henry Bradshaw of Meriden.

Announcement by the postal officials of intention to remove the sorting clerk from the first northbound train reaching Torrington daily has caused a spirited protest from local manufacturers. The removal of this clerk will mean anywhere from half an hour to an hour's delay in sorting the factory mail.

The tax commissioner, William H. Blodgett, has informed corporations carrying on business in this state, of an extension of time for payment of the state income tax. Payments must be made by September 1. The extension was necessitated by the fact that many corporations had been granted extension of time in the filing of their Federal reports.—J. H. T.

NEWARK, N. J.

AUGUST 2. 1920.

Arrangements will be made soon for the fall meeting of the Newark Foundrymen's Association. It will probably take the form of a dinner-meeting. The members do not meet during June, July or August unless some unusual condition arises in the industry to make a special meeting necessary during the hot months. P. A. Smith, secretary of the association, has received informal reports of steady receipt of orders in foundries throughout the city which have kept full forces of molders, coremakers and helpers at work. There have been no reports of labor trouble, and few complain of labor shortage during the summer months, and all of the manufacturers assert that their business at this time of the year has been up to expectations.

In four of the foundry concerns where it is estimated that 75 per cent. of the jobbing output for this city is handled, business reports generally are very optimistic. Officials of one company asserted that they had more business offered than they cared to handle at this time of the year. The labor supply was said at this plant to be poor and wages high, although selling prices left little to be complained about. Another manager said he was rushed with more work than he wanted. At the other two plants it was stated that they had orders ahead which would keep them busy for months Managers of both places stated that they were in need of additional skilled workmen, but were not bothered with any serious labor shortage.

In the jewelry trade also the trend of business throughout the summer has been brisk. In former years the factory owners have experienced slumps during the warmer months and production had been further handicapped by strikes. There has been no such reason for complaint this season. Not only have unfilled orders kept full forces of employees at their benches, but the wage adjustments have prevented repetitions of the labor trouble. Similar reports are made at the plants where metal plating forms the bulk of business done.

The largest pure copper casting ever turned out at the **American Foundry Company, Inc.,** plant at 634 South Eleventh street, is being finished there. Officials of the plant say they have never heard of a larger casting of this type. Although it will weigh 5,000 pounds when completed it took 6,500 of copper pouring to make it. The apparatus is part of a transformer to be used in a welding machine at the Brooklyn plant of the Metropolitan Engineering Company. The electrical conductivity of the casting is estimated to be 75 or 80 per cent.

Business is so good at the **C. A. Goldsmith** plant, 270 Thomas street, that its owner is considering building an addition. The project has been under discussion for some time at the plant, but it is expected that a definite announcement of building plans will be forthcoming in a few weeks.

PHILADELPHIA, PA.

AUGUST 2, 1920.

The transportation situation in this neighborhood is much better than it was one month ago, and virtually all industries in the city are getting better service in deliveries of raw materials and shipments of finished products. Business continues good generally, and many additions to plants are still under way.

Some lines are not quite so brisk as a few months ago. For instance, the machine tool markets are considered unsatisfactory by some manufacturers. According to reports, June was one of the poorest months so far this year in volume of sales, and the prospects for new business are said to be indefinite. The cause of the trouble is thought to be chiefly the tightness in money. However, the range of prices is high for all classes of equipment and machinery, and the tendency appears to be still on the upward trend.

Labor is quiet with an increasing tendency toward better stability of workers observed by many employers. A strong effect is thought to have been produced by the recent announcement of the Pennsylvania Railroad that it would soon lay off about 12,000 employees in clerical and shop jobs. Workers are beginning to realize that the demand for labor is not so keen as it was recently and the result is higher efficiency and steadier work.

The United States rifle manufacturing plant at Essington reverted on June 30 to the **Baldwin Locomotive Works,** the original owner of the property. Operations are now under way to use the buildings and shops as a plant for locomotive repairs.

A one-story plant to cost about $75,000 will soon be erected in Philadelphia by the **Prest-O-Lite Company** of New York for the manufacture of acetylene equipment.

Two new buildings to cost $246,000 are to be erected at the **Frankford Arsenal** for the production of small arms and parts. The contract has been awarded by the Ordnance Department at Washington.

The **Edward G. Budd Manufacturing Company,** manufacturer of automobile bodies, steel stamping work, etc., is planning extensions and improvements to its machine and assembling shop to cost $100,000, and similar work on another building to cost $30,000. The company has arranged for a new bond issue of $1,000,000.

The **General Metallic Hose Company,** of Philadelphia, has been incorporated at $10,000 by A. W. Swartz, H. Goodall and F. B. Williamson to manufacture reinforced metallic hose for air brake service.

The plant of the **Oxford Brass Foundry,** 1615 North Second street, was partly destroyed by fire on July 2. The loss was estimated at $20,000.

The **Philadelphia Roll and Machine Company,** Twenty-third street and Washington avenue, has plans under way for a new works at Fifty-second street and Grays avenue.

The **Lowry Top and Body Company,** Gaul and Adams streets, manufacturer of automobile bodies, plans rebuilding a part of its plant recently destroyed by fire. The cost will be about $25,000.—G. B. G.

INDIANAPOLIS, IND.

AUGUST 2, 1920.

Work has begun on the construction of a new plant for the **Pioneer Brass Works,** of which **John H. Brinkmeyer** is president. The company will build a new plant on a tract of land recently acquired at the northeast corner of Twenty-third street

and the L. E. & W. Railroad tracks. Upon the completion of the plant, the company will move from its present location at 424 South Pennsylvania street. The company expects to devote one section of the plant entirely to nickel plating. The general contract has been awarded to the **John G. Karstedt Construction Company**, 429 Lemcke Building, and the plans were drawn by **Charles Brossman,** consulting engineer.

The announcement that the interstate commerce commission is keeping in close touch with the car situation in Indiana leads the industry to the belief that Indiana may have better car service in the future. A telegram was received recently by John W. McCardle, vice-chairman of the public service commission from the Federal commission announcing the fact that the car situation was being closely watched in the Hoosier state. Mr. McCardle had sent a telegram pointing out the serious shortage here. The Indiana commission is making an effort to secure a blanket order from the Federal commission diverting a large number of cars into the Indiana territory.

Miss Lucile Blessinger, a junior in the Huntingburg, Ind., high school, has won a prize offered by the copper and brass research committee of New York for an essay submitted by her containing information on copper, copper products and brass.

The **General American Tank Car Corporation** has taken out building permits for the construction of an addition to its brass foundry at East Chicago, Ind., and for the erection of a car repair shop and sand blast shed. The buildings are part of the company's extension plans which call for the expenditure of $2,000,000.

Articles of incorporation have been filed with the secretary of state by the **Marion Aluminum Company,** Marion, Ind.; capital $10,000; commercial castings; directors, **Robert Sheron, Kiker S. Morris, William Sheron.**—E. B.

DETROIT, MICH.

AUGUST 2, 1920.

A general slowing up in all branches of the metal industry seems to be apparent in this section of the country. This is not due to anything that is affecting this industry alone, but is a condition general in all other lines as well. There is no getting around the fact that business is not so good as it was a year ago at this time, and it is quite apparent that present conditions will continue throughout the fall and winter. It is doubtful whether or not conditions will open very strong even next spring. Apparently business in general has had its little fling and it will be a long time before there is a rush such as we have had for the last year or so. Manufacturers do not anticipate anything like a panic such as has swept over the country at intervals of several years, but business from now on, for a time at least, is going to be somewhat more lady-like in whatever it does. A general spirit of carefulness seems to pervade everything and great managers of industry are watching their steps very carefully.

Banks have shut down on automobile loans and not quite so many cars are being sold as there were a year ago. But the banks have the money and it will not be long it is believed before they will become more open hearted again. It is very difficult to obtain loans and for this reason building has been almost stopped. This, of course, affects the building hardware trade. No great amount of plumbing supplies is being manufactured simply because there is little demand for anything in this line.

The demand for labor, both skilled and unskilled, is gradually falling off. Some plants are slowly reducing their forces, but thus far nothing radical has been done. Notwithstanding all this, wages continue high. Never in the history of Detroit have manufacturers been so liberal with their employees.

The old nightmare that has hung over this section is still with us. Scarcity of coal and scarcity of transportation facilities. Detroit and Michigan in general heaved a sigh of relief when it was announced a short time ago that Henry Ford had purchased the Detroit, Toledo and Ironton Railroad, a line extending 400 miles from here down into the coal fields. But we hear again that this line will only be able to supply Mr. Ford's interests and Detroit will not get much relief from the coal shortage through this new deal. Then, again, it will take months to get this particular railroad in shape even to meet Mr. Ford's demands.

The brass, copper and aluminum trades are in no worse condition than any other, but are gradually slowing up, something that has not happened for a long time. This branch of industry is almost entirely sustained here now by the automobile industry, which still is very strong among certain of the great plants. Some of the smaller concerns, however, do not seem to be doing quite as well as they were a few months ago. In a general way, it is believed the automobile business here will be good, but it is apparent it will not hold up quite as strongly as it has during the last six months or more.

Notwithstanding all the anxiety, wondering and forecasts as to the future no one seems to feel that anything radical is likely to occur. The very fact that business seems to be letting down gradually is enough to convince manufacturers that there is going to be no serious slump in anything. F. J. H.

ROCHESTER, N. Y.

AUGUST 2, 1920.

Industrial Rochester is feeling much more cheerful at the close of July than at any other period since the beginning of the year. This feeling is due to the fact that conditions on the railroads are showing improvement, and freight shipments both in and out of the city are gradually becoming easier and moving with more regularity.

With every big industry rushed with orders the shipping situation has acted as a tremendous drawback for a long period. The strike situation, too, seems to be clearing, and large users of metals hope to see normal conditions prevailing in this section before the end of 1920. Many concerns, who have been placed at a disadvantage since the trouble began in Waterbury, are now receiving materials from Rome, N. Y.

The plant of the **Van Bergh Silver Plate Company** has suffered some annoyance of late by walkouts. The first walkout was caused, it is claimed, by the fact that the company employed a number of inexperienced workers in order to increase the output. The second strike came about following the company's refusal to reinstate the men who left the plant. The plant was crippled for a short while, but a large majority of the employees remained in their departments and gradually the production returned to normal conditions.

The settling of the plumbers' strike, which had continued for some three months, has brought a resumption of building in the city, and a number of projected additions to Rochester manufactories will now go up. Among them are new buildings for the **Eastman Kodak Company,** all of which will require much steel, lead and tin-plate, and an increased demand for metals for manufacturing purposes.

Sunday, July 25, witnessed the ninetieth birthday of **John J. Bausch,** founder of the **Bausch & Lomb Optical Works,** the largest of its kind in the world. **Mr. Bausch** gave a reception to his older employees on the day previous, and distributed more than $250,000 to the employees of the plant. The **Bausch & Lomb** employees sent the aged manufacturer a bouquet of ninety American Beauty roses.

A tract of land, consisting of thirty-nine acres, has been purchased in the northwestern part of the city, and it is pretty generally known that a company, incorporated at $2,000,000, will establish a plant for the manufacture of brass castings and like products thereon. **Charles F. Wray,** secretary and treasurer of **Henry F. Wray & Son, Inc.,** brass founders, is to be president of the new concern, and **John M. Stull,** former corporation counsel will be connected with the concern as attorney. **Mr. Wray** has practically admitted that the new corporation has been formed and will be a user of metals on an immense scale. He has declined to give further details at this time.—G. B. E.

PROVIDENCE, R. I.

AUGUST 2, 1920.

There has been a very perceptible let-up in the volume of business in all the industrial lines identified with the metal trades in Providence and vicinity during the past month or six weeks. Numerous causes have combined in bringing about this condition such as a decrease in orders, transportation difficulties with the car shortage, freight congestion and embargoes and unstable rates, wage agitations and other labor controversies.

In the manufacturing jewelry lines there has been a very decided decrease in operations, but the manufacturers are expecting a brisk fall and holiday business. The summer season is always a dull one with the jewelers, but it is expected that the dull period will be longer this year than usual from the fact that the wholesalers stocked up so heavily last fall and in the spring. The export end of the business has gradually expanded and is now a valuable and important field of operation, the shipments to the Latin-American countries, especially, showing a steady and consistent increase in totals.

All of the metal lines connected with the building trades are comparatively inactive on new work because of the dearth of building operations. There is, however, considerable repair and alteration work being done that is keeping a slight movement among the concerns. Much optimism prevails among all metal workers that with the close of the summer vacation season, business will experience a revival so that the fall, winter and spring will find all the shops, factories and other plants in full swing. Two clouds seem to stand ominously above the horizon and obscure a perfect prosperity picture—railroad rates on freights and the presidential campaign—and, incidental to both is the great wage and labor problem.

Announcement was made about the middle of the month that the **S. & B. Lederer Company,** manufacturing jewelers at 100 Stewart street, and owners of several manufacturing jewelry establishments, for nearly half a century, are about to retire from business in order to devote their full attention to their realty business which has been conducted as the **Lederer Realty Corporation.** The firm was established in 1874 by the late **Edward Seery** and **Sigmund L. Lederer,** under the name of **Seery & Lederer,** but in 1877 upon the entrance of the late **Benedict B. Lederer** into the firm, **Mr. Seery's** interests were purchased and the firm became **S. & B. Lederer Company.** In 1899 the business was incorporated and the present building, corner of Stewart and Conduit streets, erected and occupied in part. Since then the firm has purchased several jewelry plants and annexed or absorbed them with their own, while other plants have been established for the handling of special lines. Thus the **Providence Stock Company** was established in 1890 and the **Rhode Island Chain Company** in 1912. The **Acme Manufacturing Company** was also one of the Lederer subsidiaries. All of these concerns are now being offered for sale by the Lederers.

H. J. Astle & Company, of Providence, has just installed a two-cylinder Boland patented blower at the factory of Rogers, Lunt & Bowlen Co., at Greenfield, Mass., and Boland dust collecting systems in the manufacturing jewelry plants of The Reliance Manufacturing Co., 144 Pine street, and the Sterling Silver Manufacturing Co., 70 Ship street.

Unanimous approval of the principal of the open shop in industry was expressed by 322 members of the **Providence Chamber of Commerce,** which includes many concerns engaged in the various metals trades, in a vote, which closed July 21, on referenda, submitted by the Chamber of Commerce of the United States. The national organization sent out questions concerning industrial relations as they affect the employee in his relations with his employer, and the regulation of public utility employees by the State.

The expressed sentiment of the members of the local chamber was in agreement with the national chamber in defending the open shop, the extension of State regulation to the workers in public utilities, the right of individual contracts and opposition to combinations of Government employees which might impair any governmental function. Voluntary association, both of employer and worker, was upheld, both to be mutually responsible for the acts of their agents and equally subject to State authority. Encouragement of the workers by the employers through the payment of fair wages, proper incentive to work, and insurance of the workers' health and safety was advised.

Restriction of production by either party in industry was condemned. A recommendation providing for the study of hours in industry was adopted. Adequate machinery for arbitration of difficulties between the workers and their employers was recommended.

In the Superior Court at Providence early in the month, **Fred S. Opie** and **A. C. Holdsworth,** of Westerly were appointed receivers of the **Westerly Brass Company.** The matter came up for a hearing on the petition of the creditors representing that the company was insolvent. The receivers have taken over the entire business of the concern.

Hamilton & Hamilton, Jr., manufacturing jewelers, Providence, have become incorporated under the laws of Rhode Island for the purpose of continuing its general jewelry business with an authorized capital stock of $250,000. The incorporators are Ralph S. Hamilton, Ralph S. Hamilton, Jr., and Robert W. Hamilton.—W. H. M.

CLEVELAND, OHIO

AUGUST 2, 1920.

Expected improvement in conditions affecting branches of the metal industry have not been forthcoming during the month. Production in the automobile and kindred lines, which offer the principal outlet has been curtailed considerably for several reasons, notably the reduction of loans by the banks and other financial interests, and the inability of those concerns which can finance their projects to obtain materials. Here, again, is reflected the stringency in the freight situation. The relief from car shortage and switching handicaps, which was noted a month ago, has proved to be only temporary and generally the freight tie-up is worse than ever. Some relief from the independent attitude of railroad labor is expected by industry in generally following the wage award at Washington, but tardy acceptance of the proposals makes it now appear that the men are not too keenly disposed to take these offers. In any event the offers have been turned down by Cleveland rail workers, and locally conditions are no better.

The plumbing trade still faces a partial tie-up following the two months' strike of union journeymen plumbers. This means there has been less demand for those lines supplying the plumbing trade itself. Many of the contractors among plumbers have agreed to put to work those men who wish to come back, but no agreement on the $12-a-day wage demand, with contractors supplying all tools as well, has been reached. Moreover, though the plumbing tie-up has held back building operations, there is less demand for all forms of building equipment now than there was four weeks ago.

In fact, there are many leaders in all lines of industry here who now believe that business has reached the peak, and that a reaction has already started that eventually must bring conditions something near to normal again. Proof of this assertion is seen in the fewer number of new concerns to start business in Cleveland district this last month, and the almost total lack of new industrial building being planned.

Among the few new firms to pick Cleveland for their location is the **Hi-Voltage Equipment Company,** which will make a line of high voltage electrical apparatus. The company has been incorporated for $100,000. A building at Croton avenue and East Thirty-fourth street has been leased. Machinery and materials are being installed and production is expected to be under way early in August.

A report that has not been confirmed here, has been received in Cleveland to the effect that **E. W. Bliss and Company,** Brooklyn, N. Y., is seeking the purchase of the **Cleveland Machine and Manufacturing Company** of this city, and the **Buckeye Engine Company,** Salem, Ohio. **E. S. Griffiths** is president of the Cleveland concern and **John Kaster** vice-president and treasurer. The Bliss firm was expecting to hold a special stockholders' meeting August 1 to arrange for additional financing to carry out the purchase project.

Army engineers who were sent here from Washington, have expressed the opinion that Cleveland will become a center for experimental work in the manufacture of army tractors, tanks and trailers. The ordnance department has leased a building at Carnegie avenue and East Sixty-sixth street, where these experiments are to be carried on. About 50 engineers and draftsmen are working at the plant now. In a contest with commercial tractors a baby caterpillar tractor put out by the army made nearly 100 per cent record. The contest was from Cleveland to Ottawa Beach, Mich. **Captain G. R. Pennington** is in charge of the station here and **S. K. Wellman** is assistant engineer.

Damage to the extent of $100,000 was done by fire to the

plant of the **Ohio Bronze Powder Company**, East 152nd street, following an explosion of a cask of molten metal. It is believed friction from one of the grinding machines set fire to chemicals. Production will be continued in separate building belonging to the company, according to Dr. George F. Glass, president of the company. Several firemen were hurt when the cask of metal exploded.

Following a fire in the japanning plant of the **Jordon Motor Car Company**, which did $100,000 damage, rebuilding has been started. The original plant was completed less than a month before it was burned. The new plant to take its place will be twice as large.

Following failure of conference committee to agree on wage demands submitted some time ago, 500 pattern makers in 35 plants in the Cleveland district have struck. The workers demand $1.75 an hour against the original wage of $1.25. Employers agreed to $1.50. Work in such plants where there are active foundries is expected to be affected.

Henry J. Hunger, president of the **H. J. Hunger Brass Works**, died July 6 at his home in Lakewood, Cleveland suburb following an operation. Mr. Hunger, who was 51 years old, came to America when 12 years old, settling in Cleveland. In 1899 with Gotleib Scheidegger he established the brass foundry. The partnership was dissolved in 1916. Mr. Hunger had a wide acquaintance in the many industries in the Cleveland district, particularly among the plumbing interests.—C. C. C.

COLUMBUS, OHIO

AUGUST 2, 1920.

More strength is apparent in the metal market in Columbus and central Ohio as compared with conditions a month ago. Buying is slightly more active and in most metals there is a firmer feeling. This is in striking contrast to conditions sometime ago when weakness developed all along the line. Metal using concerns are entering the market and buying more liberally, although orders are still restricted largely to immediate wants.

There is still considerable uncertainty as to the future, but metal using firms are more inclined to take a chance. While there is some feeling that prices may go lower, still some concerns believe that they have reached the bottom for the time being at least and are inclined to buy more liberally.

The Hammond Metal Products Company, of Cleveland, has been chartered with a capital of $15,000 by H. R. Hammond, R. E. Westervelt, H. D. Leach, D. J. Needham and G. C. Brainard.

The **Empire Brass Manufacturing Company**, of Cleveland, has filed papers with the secretary of state increasing its capital from $50,000 to $100,000.

The **Thomas J. Nichol Company**, of Cincinnati, has been chartered with a capital of $30,000 to manufacture and deal in brass goods and supplies. The incorporators are Thomas J. Nichol, Donald K. Nichol, Edith McAndrew, Belle McMillan and John G. O'Connell.

The **Atlas Brass Foundry Company**, of Columbus, has moved into new quarters at 980 South Park St., where larger shop facilities are afforded. The new foundry at that place has been completed and the capacity of the plant has been more than doubled. All modern machinery and equipment has been installed including an overhead traveling crane. Plans have been made for building a larger office.—J. W. L.

TRENTON, N. J.

AUGUST 2, 1920.

Disgusted with having to settle labor troubles at different times of the year, especially when business was brisk, the manufacturers of New Jersey have declared for the "open shop." They regard the restriction of the output as a menace to society. A section of the manufacturers' association, adopted by the men, reads: "The right of open shop operation, that is, the right of employer and employee to enter into and determine the conditions of employment relations with each other, is an essential part of the individual right of contract. The restrictions of productive effort or output by either employer or employee for the purpose of creating an artificial scarcity of the product or of labor is an injury to society."

A committee of the manufacturers recommended that "strikes by employees of all public service corporations performing public service essential to the lives, health, security, comfort and well-being of the people, should by law, be explicitly prohibited." A suitable tribunal for the settlement of labor differences is suggested. The Manufacturers' Association represents about 200 of the leading manufacturers of New Jersey.

The Trenton manufacturers are becoming alarmed again over the scarcity of coal and are working hard to keep enough on hand to carry them over until the outlook becomes brighter. Some of the concerns, which usually store away considerable coal during the summer months for the winter season, are now unable to get enough for that purpose. Many of the manufacturers secure power from the Public Service Electric Company and do not depend upon their own plants

The **Orr Machine Guarding Company**, of East State street, has let a contract for a modern plant on Calhoun street, for the manufacture of metal machine guards. The plant will be two stories, 50 by 75 feet, together with an office. The structure will cost $30,000 and will be built by Contractor William Hicks, of Trenton. Walter H. Orr is the president of the company and he also directs the activities of the concern.

The **Ingersoll-Trenton Watch Company** has let a contract to Elmer W. Schenk for the erection of a frame storehouse adjoining the plant on Monmouth street.

Landers, Frary & Clark, of New Britain, Conn., manufacturers of kitchen hardware, have leased the building at Sussex and Dey streets, Newark, N. J. The company has taken a lease for a term of years and will employ many skilled hands.

The **Westinghouse Lamp Company** has purchased a large tract of land in Arlington avenue, Bloomfield, opposite the company's Watsessing branch, and will use it for expansion. The plot has a frontage of 600 feet on Arlington avenue and comprises a total of 2.6 acres. The company says it will erect a big addition on the land, but the work on the same will not begin at a very early date.

Eight thousand men will be employed in the course of time by the **United States Aluminum Company**, of Edgewater, N. J., following the completion of an immense addition to its plant along the Hudson river, near Hoboken, according to counsel for the company. The State Board of Commerce and Navigation has approved an application of the company for a grant of 525 feet of riparian land in the Hudson at Edgewater for use of the concern. The company deeded to the state the right of way across its land so that the Commerce and Navigation Department could reach lands under water further out in the stream, that is, if the company did not apply for and be given a grant for the land at some distant time.

The strike of the 350 employees of the **American Type Foundry** at Jersey City has been settled and the plant is running in full operation again. The men struck recently for a closed shop, but returned to work under the old conditions.

The New Jersey Public Utility Commission has granted the application of the New York Bay Railroad Company for the sale of a tract of land at Hawkins street and Plum Point Lane, Newark, to the **Interstate Smelting and Refining Company** for $10,000. The tract contains 69,617.59 square feet.

The **Keystone Sheet Metal Works, Inc.**, of 610 Broad street, Newark, N. J., has been incorporated with $10,000 capital stock by Samuel Kibbel, Paul Kalin and Adolph Wasserber.

Libby Welding Company, of 113 Frelinghuysen avenue, Newark, N. J., has been incorporated with $50,000 capital stock by Clifford S. Libby, Louis K. Schwartz and Frank P. Russell.

The **Ehrlich Company**, of 665 Newark avenue, Jersey City, has filed articles of incorporation and will take over the concern of **Ehrlich & Sinnock**, manufacturing jewelers of Newark. The capital stock is placed at $100,000 and the incorporators are Margaret Ehrlich, of 45 Osborne Terrace; Julius F. Ehrlich, of 682 Nergen street, and August J. Ehrlich, of 50 Baldwin avenue, all of Newark.

Maple Buckram Company, of Perth Amboy, N. J., has been incorporated with $50,000 capital stock to manufacture metal hat frames. The incorporators are Barney Billet and Max Devitt, of New York, and L. S. Lowenkopf, of Keasby, N. J.

Joseph H. Shafer, 89 years old, president of the **Shafer & Douglas Company, Inc.**, manufacturing jewelers of Newark, N. J., died on July 17 at his home, 32 Beekman road, Summit, N. J. Death was due to pneumonia, from which he had been suffering for a short time. He leaves a family.—C. A. L.

LOUISVILLE, KY.

AUGUST 2, 1920.

Business with the coppersmiths and metal working trades of Louisville is good as a whole, there having been a very fair volume of orders placed for castings, while sheet work is better than had been anticipated. The plating companies are generally busy. There is a good increase being shown in demand for aluminum castings, and development in production of aluminum goods is quite noticeable.

There has been a big slump in production of automobiles as a result of tight money markets, and inability of retail dealers to finance sales. Reports received from various sources show that cancellations have been placed on thousands of orders for various lines of material. At a recent textile meeting in Louisville it was reported that very heavy cancellations had come in on tire, top, cushing and other fabrics, and it was also stated that manufacturers of castings and parts used in automobiles have suffered big cancellations. Tire manufacturers at Akron, Ohio, have laid off more than 30,000 men, it is claimed.

The **Maxwell Motor Plant** at Greencastle, Ind., has been down for a month, and the **Kentucky Wagon Manufacturing Company,** Louisville, manufacturers of the Dixie Flyer, a medium priced auto, laid off 200 men in the week of July 19, these men coming from the auto department, which is letting up. The drop forging, wagon and other departments are operating full.

There has been a good demand for brass journals for railroad cars, due to increased building by railroads, and due to construction of thousands of cars by big industrial concerns, which are now owning their own coal cars, and mines, in order to assure supply. Car foundries are generally busy.

Labor conditions, as a whole, are fairly easy in Louisville at the present time. There are no shortages reported, and prospects being for a decided improvement in conditions as a result of labor having to go to the employer, instead of employer coming to labor. Louisville is maintaining the open shop principle, and while not fighting the unions, is refusing steadfastly to give any ground in the open shop matter.

Although things have been in a slight slump in some lines of business, it is believed that the low level of the slump was reached in June, and that things will now improve. Prospects in the metal working trades are considered good.

SAN FRANCISCO

AUGUST 2, 1920.

San Francisco is assuming great importance as a port of import and export for American metals. This port has become the greatest port of silver shipment in the world. The outward flow of silver via the Golden Gate in 1918 reached the vast total of $200,918,373. The Orient took it all and called for more. The treasure vaults of almost every outgoing steamer during the second half of the year were packed with it, and additional consignments frequently were refused. The great bulk of it went to British India, where the bazaars devoured it. The total value of silver consigned to India was $159,577,672.

People are allowed to melt silver coin freely in India and they are taking advantage of it. It may be of interest to know what becomes of all this silver that is shipped to India. The accompanying photographs clearly illustrate what becomes of a good part of it. These photos, taken recently by an official of the Pacific Mail Steamship Company, while on an extensive tour of India, tell the story. This official stated that there were large numbers of small shops throughout the land which were devoted to the melting up of money into trinkets, and bracelets, necklets, anklets, etc.

These coins are being manufactured at the San Francisco Mint, the workers there having recently finished a consignment of 15,000,000 one-cent pieces. The one cent pieces are about the size of our 25-cent piece, but each has a hole in the center so that the coins can be strung like the Chinese "cash" to which many of the natives of Indo-China are accustomed. Everything connected with the production of these coins was carried out in the United States Mint, at San Francisco, with the exception of the cutting of the dies, which was done, according to the French official designs, at the Philadelphia Mint. However, with the completion of the new mint in the Philippine Islands, the San Francisco mint will no longer be called upon to turn out coins for Oriental countries.

Up to June 1, 1920, $53,707,174 in domestic gold and $47,492,163 in domestic silver had been exported from San Francisco since

WHERE A LARGE PART OF THE SILVER GOES.

the first of the year for foreign ports, principally the Orient. In 1919 exports of gold up to this time were practically nothing, but silver exports were extremely heavy. During the second half of 1919 shipments of the two during a single month approached each of the foregoing figures.

SILVER BARS BEING SHIPPED.

Of the total exports, those of the domestic metals still constitute the bulk. During May $2,536,465 in domestic gold and $3,262,573 in domestic silver were exported. Of foreign metal

only $20 in gold was exported during May or since January 1. But $3,177,588 in foreign silver was exported, making $13,973,585 since the first of the year. Shipments of domestic gold and silver to non-contiguous territory of the United States like Hawaii during May amounted to less than $40,000 for both. At the present rate exports of gold and silver will fail far below the 1919 record for the port, which has been the heaviest shipper of any port in the country.

Out of $530,354,569 worth of gold and silver exported by the United States during the first eleven months of 1919, $300,973,000 worth approximately, went through the port of San Francisco. Out of $208,426,260 in silver shipped out by the nation, San Francisco shipped $132,632,000 worth. As an importer of the too precious metal the port, of course, enjoys no such monopoly, but it received during the first eleven months of 1919 approximately 24 per cent. of the total, or roughly, $34,000,000 out of $143,345,216.

Among the other metals, tin bars are the largest item imported and tin plates is the largest item exported. During January, 1920, approximately $1,095,000 worth of tin bars were imported through the port of San Francisco, of which $854,542 came from the Straits Settlements and $241,261 from Australia. Pigs of tin are shipped in from Singapore, made into tin plate in America, and shipped back to Singapore, to be used in the manufacture of cans for various purposes.

Tin plate is shipped in large quantities from San Francisco to the Hawaiian Islands, Philippines, China, Japan and Alaska, and is used largely in the manufacture of cans for canning fruit, fish and for carrying vegetable oils and petroleum oils. Very large shipments of vegetable oil such as cocoanut oil, and soya bean oil are made in tin cans. The cans hold five gallons each, and two cans constitute a case. Immense quantities of tin plate are used in the Hawaiian Islands, being made up into cans for the pineapple canning industry, which is rapidly increasing. Every year during the fishing season large quantities of tin plates are shipped to Alaska, where they are made up into cans for the canning of fish.

Pig lead is shipped to Japan in considerable quantities, much of which is used for lining tea chests. Exports of pig lead from San Francisco in June, 1919, totaled 3,767,725 lbs.

Other metals exported through the port of San Francisco are zinc, quicksilver, copper.

MONTREAL, CANADA

AUGUST 2, 1920.

The resumption of foundry activities to a certain extent has given relief to many manufacturers, as the threatening scarcity was beginning to affect the operations of plants getting outside castings. There is a slight improvement in scrap activity, probably due to a resumption of work in local shops following a brief period of idleness. A slightly increased demand has been noted on scrap zinc and brass. Although dealers are not forcing a decline it is believed that the market is still weaker generally. The needs of the trade apparently are as insistent as ever, but owing to the prevailing uncertainty regarding deliveries of materials many plants are forced to curtail production. Normal conditions will probably be revived when the railroad situation becomes stabilized

An association was formed here when representatives of a number of prominent waste material dealers met at the Windsor Hotel. It was unanimously decided to organize the Canadian Waste Trade Association. The association will include in its membership firms who deal in waste materials. The following firms among others were represented at this first meeting: Northeastern Iron & Salvage Company, Frankel Brothers (metal dealers), National Scrap Iron & Metal Company, Louis Pickering & Company, Consumers' Metal Company of Lachme, Northern Iron & Equipment Company, Laxer, Deicher Company, L. S. Tarshis & Sons. The officers elected were: President, J. J. Sophus; secretary, Louis Frautex; treasurer, H. Frankel.

Balfour, White & Company, investment bankers, St. James street, Montreal, placed on the open market $150,000 8 per cent cumulative preferred stock of the Galt Brass Company. This industry is well established and makes a line of plumbing and sanitary brass goods.

The Jenkins Brothers Company, Limited, dedicated their new machine shop building on Wednesday evening, June 30. All their employees, their wives and families assembled with the staff and management to the number of 900, and enjoyed themselves at a dance and euchre.

Old age pensions are to apply to any employees who have been in the employment of the company for 20 years. P. W. B.

BIRMINGHAM, ENGLAND

JULY 19, 1920.

The British Non-Ferrous Metals Research Association is making progress with its work, though so far it has been handicapped through the difficulty of finding suitable housing. A number of new members have been enrolled and the research work is being gradually extended. The Birmingham Brass & Copper Research Laboratory, which has been taken over by the Association, has had to be closed, the tenancy of the premises in Paradise street having expired, but will be continued at Smethwick, where Allen, Everitt & Sons, Limited, have placed at the disposal of the association the new laboratory which they had provided for themselves. The association is taking over part of the work on corrosion undertaken by the Institute of Metals, and will deal specially with atmospheric corrosion of metals. It is intended to take up shortly the investigation of refractory materials for furnace purposes in collaboration with the National Physical Laboratory.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The **Delaware Brass and Aluminum Company,** Muncie, Indiana, are erecting additions to their foundry. C. Beckett is secretary and treasurer.

C. W. Leavett & Company, 30 Church street, New York City, have placed on the market a substitute for tin oxide called "Enamelox," for use in the production of enamelware of a white color.

The **Edison Lamps Works** of the General Electric Company, Harrison, N. J., are building a two and three-story, 150 x 300 ft. lamp factory on Winter street, Fort Wayne, Ind. Estimated cost, $100,000.

The **Atlas Brass Foundry,** 980 South Park street, Columbus, Ohio, has awarded the contract for the construction of a one-story 80 x 100 ft. brass foundry on Stewart avenue, estimated to cost $20,000, to Nonnemachee and Frank, 427 Citizen Bank building.

The **Johnson Bronze Company,** New Castle, Pa., is planning the erection of an addition to its plant to house a foundry and machine shop. They operate a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room and casting shop.

The **International Silver Company** has let contract for the construction of a one-story, 44 x 106 ft. addition to the plant formerly belonging to the **Florence Company,** at Florence, Mass., which will be known as Factory F. An addition will also be made to the boiler plant.

The **William Cramp and Sons Ship and Engine Building Company,** Richmond and Norris streets, Philadelphia, have increased their capital from $6,250,000 to $20,000,000. They operate a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, galvanizing and tinning departments.

The **Dallas Brass and Copper Company** announce the completion and occupancy of their new building at 820 Orleans street, Chicago, Ill. The building cost $400,000 and is of modern fireproof, concrete construction, containing 100,000 feet of floor space, and is so constructed that two additional stories can be added when desired.

The Badger Bearing Company, 157-159 Buffalo street, Milwaukee, Wisc., manufacturers of bearings, has increased its capital stock from $10,000 to $20,000 for the purpose of enlarging its facilities and output. They also manufacture tools,

dies, fixtures and special machinery. Charles Strassmann is secretary and treasurer.

The **Louisville Aluminum and Brass Foundry,** 721 to 729 East Main street, Louisville, Ky., has been incorporated by William O. Bonnie, Jr., Elmore Sherman and E. E. Kirwan, with a capital of $60,000, to manufacture aluminum and brass products. Elmore Sherman is president. They operate a brass, bronze and aluminum foundry.

The **Dominion Brass Products, Ltd.,** Toronto, Ont., has been incorporated to manufacture brass, etc., by Thomas B. Richardson, Room 41, 2 Wellington street East; Edward A. H. Martin, 44 Elgin avenue, and others. They operate a brass machine shop, tool room, grinding room, brazing, soldering, polishing and lacquering departments.

The **Veeder Manufacturing Company,** Hartford, Conn., manufacturers of bicycle parts, cyclometers, etc., has filed plans for a one-story storehouse on Sargeant street. This company does alloying and refining of white metal, operates a brass machine shop, tool room, grinding room, white metal die casting shop and plating department. They manufacture bicycle parts, cyclometers, etc.

The **New York Testing Laboratories,** L. R. Seidell, managing director, have been awarded the contract for the chemical, physical and electrical testing of approximately 400,000 feet of fire alarm, telegraph and police signaling cable and wire by Mr. A. E. Roche, engineer, for the city of Troy, the inspection being under the supervision of Mr. G. Brinton Jack, Jr., Director of Inspection and Tests.

The **Ohio Bronze Company** plant, 1120 East 152nd street, Cleveland, Ohio, was recently gutted by fire, which started in the polishing room in the rear part of their factory. They are at present operating the front part of their factory and expect to be able to get into the rear factory about September 1 to 10. They are making shipments daily. Their loss is between $70,000 and $80,000, which is fully covered by insurance.

The **New Departure Manufacturing Company** plant in Meriden, Conn., will be under the direction of Charles Gearing, as division manager. The Meriden plant, which will be known as plant "D," is now nearing completion and will be a modern brick and reinforced concrete plant, with all possible conveniences. It has an area of 315,500 sq. ft. floor space. The home and plants A and B of the New Departure Company are in Bristol, Conn. Plant C is in Elmwood, Hartford, Conn., and the new plant in Meriden. They operate a tool room and grinding room and do press work, machining, heat treating and grinding.

The **Springfield Aluminum Plate and Castings Company,** Springfield, O., has been formed to take over the business carried on heretofore as a partnership under the same name. Their chief product is aluminum vibrator plates, but they contemplate production of large work. On July 1 the company moved into new and larger quarters. The officers are: President and general manager, E. A. Parker; secretary and treasurer, W. J. Jordan; vice-president, I. F. Hook. These men with H. S. Simonson and W. Ream compose the board of directors. They are in the market for a jib crane, oil storage tank and a good second hand shaper and drill. They operate an aluminum foundry and pattern shop.

AMERICAN METALLURGICAL CORPORATION

The **American Metallurgical Corporation,** Philadelphia, who were the controlling factors of the Philadelphia Electric Steel Corporation, announce the reorganization of that company's affairs along the following lines.

E. C. Hummel, who has been the electric steel foundry superintendent at the United Alloy Steel Corporation, Canton, O., has purchased a controlling interest and has reincorporated the company, which will be known as the **Philadelphia Electric Steel Castings Company.**

The new directors and officers of the corporation will be: **E. C. Hummel,** president and general manager; **F. J. Ryan,** vice-president and treasurer (Mr. Ryan is also president of the American Metallurgical Corporation); **F. H. Schrenk,** secretary (Mr. Schrenk is also the attorney for the American Metallurgical Corporation); **C. T. Hess, director** (Mr. Hess is vice-president of the E. P. Wilbur Trust Company, Bethlehem, Pa.); **R. V. Mitchell,** director (Mr. Mitchell is the manager and secretary of the United Securities Company, Canton, O.).

The American Metallurgical Corporation retains a 40 per cent. interest in the new corporation. Operation under the new management will commence on July 9 and it is the intention of the new controlling factors to considerably enlarge the plant as soon as production has been reached through the present equipment. The furnace capacity has already been doubled.

THE INTERNATIONAL NICKEL COMPANY

CONSOLIDATED GENERAL BALANCE SHEET, JUNE 30, 1920.

ASSETS.

Property	$48,401,797.97
Investments	1,644,200.06
Inventories	8,301,832.31
Accounts Receivable	2,471,701.60
Loans on Call	1,015,000.00
Cash	4,173,492.47
	$66,008,024.41

LIABILITIES.

Preferred Stock	$8,912,600.00
Common Stock	41,834,600.00
Accounts Payable and Tax Reserves	2,859,410.13
Preferred Dividend No. 59, payable Aug. 2, 1920	133,689.00
Accident and Insurance Funds	358,111.97
Exchange Reserve	250,000.00
Surplus April 1, 1920	10,391,233.38
Profit and Loss (Balance as per Statement)	1,268,379.93
	$66,008,024.41

CONSOLIDATED GENERAL PROFIT & LOSS STATEMENT.
THREE MONTHS ENDING JUNE 30, 1920.

Earnings		$2,172,097.06
Other Income		272,208.32
Total Income		$2,444,305.38
Administration & General Expense	$160,651.38	
Reserved for U. S. & Foreign Taxes (Estimated)	306,973.33	467,624.71
Net Income		$1,976,680.67
Depreciation & Mineral Exhaustion		574,611.74
Profits		$1,402,068.93
Dividends:		
Preferred No. 59, payable August 2, 1920		133,689.00
Balance		$1,268,379.93

NEW YORK, AUGUST 2, 1920.

TRADE PUBLICATIONS

Electroplating with Trisalyt.—The sixth edition of a pamphlet issued by Roessler & Hasslacher, New York City, giving the uses of trisalyt and formulae for various plating baths.

How to Operate a Sandblast.—Bulletin 5 of the Equipment Manufacturers' Association, to be inserted in their binder.

Knock Down Your Plating Costs.—A leaflet explaining how to accomplish this result, by the U. S. Electro Galvanizing Company, 28 Stockton street, Brooklyn, N. Y.

British Non-Ferrous Metals Research Association.—A pamphlet giving a brief survey of the scheme of industrial and scientific research in relation to the metal industry. Issued from the office of the association, 29 Paradise street, Birmingham, England.

Technical Bulletin.—Number 6 of a series issued by the Solvay Process Company, Syracuse, N. Y., covering the determination of impurities in sodium carbonate, sodium bicarbonate and modified sodas. These methods have been compiled from selected standard authorities with modifications by the company's laboratory and are the result of many years of experience.

Thermit Pipe Welding Pamphlet.—Issued by The Metal & Thermit Corporation, New York City. The new pamphlet describes and illustrates in detail how Thermit pipe welds

are made and contains reports on successful tensile strength and vibration tests of Thermit pipe welds conducted by Stevens Institute. One of the features of the new pamphlet not previously published in former editions is a chart showing the comparatively low cost of a Thermit welded pipe as compared with the cost of installing compression flanges with bolts and gaskets, and of installing elbows with flanged connections.

Portable Conveyors.—Issued by Portable Machinery Company, Passaic, N. J. This is complete with illustrations showing the various uses of the scoop conveyor and other portable conveyors manufactured by them, and describes clearly the labor, time and money-saving features of the machines in storing, reclaiming, loading and unloading material such as coal, coke, ashes, sand, gravel, crushed stone and fertilizer.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$600	$700
American Brass	100	189	195
American Hardware Corp.	100	133	138
Bristol Brass	25	26	28
International Silver, com.	100	25	30
International Silver, pfd.	100	85	90
New Jersey Zinc	100	190	195
Rome Brass & Copper	100	130	140
Scovill Mfg. Co.	100	380	410
Yale & Towne Mfg. Co.	..	275	285

Corrected by J. K. Rice, Jr., & Co., 26 Wall Street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

COPPER

July sales of copper are estimated to have been about 50,000,000 pounds. The outgo to foreign ports, actually shipped, was close to 20,000 tons, but complete returns are not yet available. Delivered prices in the outside market, at the end of the month, for prompt and August shipments, were 18.62½c. for prime lake, 18.50c. f. o. b. refinery for electrolytic and 18.00c. for casting, as compared with 18.50c. for prime lake, 17.87½c. for electrolytic and 17.62½c. for casting, prompt and early deliveries, late in June. The highest prices in July were 19c. for prime lake, 18.75-19.00c. for electrolytic and 18.75c. for casting. These quotations on July 8, followed a gradual advance during the first week and were maintained unchanged until July 21, when a slow decline began, which on July 30 had carried to 18.62½c. for prime lake, 18.50c. for electrolytic and 18.00c. for casting. While the closing figures show a decline of ⅝c. per pound from the highest prices of the month, they were ⅜c. per pound higher on prime lake, ¾c. per pound higher on electrolytic and ½c. per pound higher on casting than the lowest prices in June. Producers' prices, at the end of July, for prompt and third quarter delivered, were 19.00c., and for fourth quarter delivered 19.00-19.25c., the same figures that prevailed July 1. Producers report very little current business for either nearby or future shipments. In the outside market also, demand continues light, as there is small interest shown in future positions.

U. S. Geological Statistics covering first six months, 1920, disclose exports closely approximating an average of 66,000,000 pounds a month, the total outgo having been about 400,000,000 pounds. These figures reveal exports, in 1920, to have increased 74 per cent over the outgo during first six months 1919. Output of refined copper during first six months, 1920, has been estimated 900,000,000 pounds and smelter output 700,000,000 pounds. Surplus stocks at the beginning of July were approximately 475,000,000, indicating more than ample supplies to meet present domestic and foreign requirements. According to trade opinion, the outlook is optimistic, the belief being that accumulated demand for copper will be released as soon as the generally unsettled business situation is cleared of depressing influences.

TIN.

The tin market in July opened at an advance of ¾c. per pound to 49c. for spot Straits, 47c. for Banca, 48c. for American pure and 46c. for 99 per cent metal. The advance continued to 50.25c. for Straits, 48.25c. for Banca, 49.75c. for American pure and 47.25c. for 99 per cent metal. In sympathy with a sudden change in London, interest waned, the market turned dull, and on July 6 prices here declined about 2c. per pound. Improved demand among dealers then carried prices upward, Straits advancing on July 12 to 51c., Banca to 49.75c., American pure to 50c. and 99 per cent metal to 47c., these being the highest prices of the month. Continued pressure to make sales then combined with the silver situation, and by the middle of the month, prices had declined about 1c. per pound. With the market almost stagnant here, prices continued to fall off until July 22, when Straits was 48.75c., Banca 47c., American pure 46.75c. and 99 per cent metal 45c. per pound. A sharp rally in London was followed by an advance in quotations here, but small interest was developed. Straits metal, later in the month, was reported as being scarce, quotations July 30 being 48.75c., while Banca and American pure were each respectively, 46.75-46.50c. and in plentiful supply; 99 per cent metal was offered at 44.50c. per pound. Thus, the net result of fluctuations was a decline of ¾c. per pound on Straits, ¼c. per pound on Banca, 1½c. on American pure and on 99 per cent metal. Arrivals in July were again large with 3,040 tons reported at Atlantic ports by July 30, and 1,645 tons at Pacific ports making a total of 4,685 tons.

LEAD.

Demand for lead early in July showed improvement, this being reflected in gradually advancing prices in the outside market, from 8.20c. East St. Louis, 8.60c. New York, July 1, to 8.45c. East St. Louis, 8.80c. New York on July 13, when New York spot was still scarce, although plentiful supply existed in the West, or were in transit. Prices continued firm, advancing daily until July 21, when quotations were 8.75c. East St. Louis, 9.10c. New York for prompt shipment from the West. The leading interest on that day—its quotations in the meantime having remained 7.75c. East St. Louis, 8.00c. New York—advanced prices ½c. per pound, to 8.25c. East St. Louis, 8.50c. New York. The spread between prices in the two markets had become unusually wide, there being a difference of 1.10c. per pound in New York prices. The advance made by the American Smelting & Refining Company, reduced the spread to a more normal basis, but there was still a difference of ½c. per pound. At the end of July the leading interest had made no further change in its basis. In the outside market, the advance was continued until July 26, when quotations were 8.80-8.90c. East St. Louis, 9.15-9.25c. New York. The market was very firm, stocks were reported small with production about 60 per cent of normal. Consumptive demand was steady. The net advance in the outside market, at the end of the month amounted to 60 points. The situation was strong, with offers of lead afloat from Great Britain in limited amounts at about ½c. per pound above the "official basis" finding ready sale because of the actual shortage of supplies in New York.

ZINC.

The zinc market after closing firm, but quiet, at the end of June, made an advance in prices July 1 to 7.65c. East St. Louis, 8.00c. New York for prompt and July shipments; August and September shipments being held five points higher. With inquiries in the market from galvanized mills and the expected strike of Amalgamated Workers not called, conditions were decidedly improved. Brass special, also was in active demand and not easy to obtain at 8.00c. per pound East St. Louis basis. The advance continued, quotations being 7.80c. East St. Louis, 8.15c. New York; July 2, the market was strong in sympathy with the rise at London and the dubious outlook as to production here, with strikes again threatening. During second week the situation was easier and prices declined five points. Increased activity in the brass trade was followed by rising prices, which by July 13 were up to 7.90c. East St. Louis, 8.25c. New York, brass special being in active demand at 8.12½c. The rise continued, peak prices were reached on July 19, at 7.95c. East St. Louis, 8.30c. New York for prompt and August shipment, August and September being five points higher. On the following day, with the Waterbury strikes ended and the men returned to work, demand fell off, and prices were shaded, the decline continuing slowly

thereafter to 7.70c. East St. Louis, 8.05c. New York on July 30. Thus, the net result was an advance of five points, but fluctuations covered a range of 30 points from the highest to the lowest.

ALUMINUM.

Prices of aluminum in both markets were unchanged during July; producers' schedule being 33c. for 98-99 per cent virgin, 31.50c. for No. 12 and 44.20c. for sheet 18ga and heavier. In the outside market figures were 31.50-32.50c. for 98-99 per cent virgin, 31.00-31.50c. for 98-99 per cent remelted, and 29.50-39.50c. for No. 12 remelted. Considerable offerings of Norwegian metal, due to arrive in August, were available at 39.50c., duty paid, New York, early in the month. This metal was in the shape of ingots weighing twenty pounds. With transportation difficulties still hampering business, shipments in some instances were more or less delayed. Importations of aluminum during first five months 1920, amounted to 8,819 tons, this amount being 943 tons in excess of total importations in the entire twelve months of 1919, when arrivals amounted to 7,876 tons. Exports during first five months 1920 were 3,210 tons, this quantity being 1,175 tons in excess of total exports in all of 1919.

ANTIMONY.

The downward trend in prices of antimony was continued in July, prices declining ¼c. per pound from 7.50c., duty paid, New York, for wholesale prompt deliveries, to 7.25c., duty paid, on July 28, with no further recession when the month was ended. Small buying interest and large supplies were responsible. Jobbing business was done at the usual ¼c. to ½c. per pound above wholesale prices.

SILVER.

With the price of silver mined and smelted in the United States pegged at 99½c. per ounce for bars by the Pittman act—equivalent to $1 per fine ounce—fluctuations in prices of silver of foreign origin become very interesting. The total range for July was 6½c. per ounce, from 90½c. at the beginning of the month to the lowest point, 88¾c. July 19, the highest being 95c. on July 26. The closing was 92¼c., making the net advance 1¾c. per ounce. Further purchase made by the U. S. Mint in July brought the total purchased under the Pittman act to 8,450,000 ounces on July 28, leaving a balance to be purchased of 198,500,000 ounces, the provision calling for a total of $207,000,000 worth of silver. Exports of silver in May, 1920, according to U. S. Bureau of Commerce statistics were $6,862,130, as compared with importations of $8,082,895, showing importations in excess of exports amounting to $1,220,765. This becomes interesting when compared with exports in May, 1919, amounting to $28,598,604, arrivals being $7,913,379, showing exports in excess of importations amounting to $20,685,225

QUICKSILVER.

With the arrival of increased supplies in July, prices declined $2 per flask of 75 pounds on July 26 to $88 per flask. Previously during the month, the June closing, $90 per flask, had prevailed. Output during first quarter 1920, according to statistics that became available in July, amounted to 4,899 flasks (75 pounds each), this quantity is 852 flasks less than output in last quarter of 1919. Quicksilver on hand at mines or in transit to the market on March 31, 1920, amounted to 4,160 flasks. Exports of domestic quicksilver during May, 1920, were 4,399 pounds, valued at $5,197.

PLATINUM.

The price of platinum after being unchanged at the June closing, $85 per ounce until July 8, on that day declined to $80-85 bid and asked, these figures being the daily quotations thereafter during the month. Importations in May amounted to 3,948 ounces unmanufactured, 654 ounces ingots, bars, plate, etc., and 192 ounces vases, retorts, etc., for chemical uses and all other uses. Total valuation was $490.273 Exports of domestic platinum in May amounted to 75 ounces valued at $10,287.

OLD METALS.

Old metals drifted at unchanged prices until July 12, when a slight improvement in the major copper market developed a more optimistic sentiment, with a slight rise in light copper. Aluminums, about the same time, weakened. By the end of the month, light copper was up ¾c. per pound to 13.75c., strictly crucibled ½c. to 15.50c. and uncrucibled copper wire ¼c. to 14.75c. Cocks and faucets advanced ¼c. to 11c., block tin pipe 2c. to 42c. and pure tin foil 1c. to 34c. Each of the following items advanced ¼c. per pound—tea lead to 4.75c.; heavy lead to 7.25c.; new zinc scrap to 7c. and heavy brass to 9.25c. per pound. Old sheet and old cast aluminum, each was off ½c. to 22.50c. and aluminum clippings were down 1c. to 25c. per pound. The only other decline on the list was No. 1 composition scrap, which was off ¼c. to 14c. Prices at the end of July were firm, the outlook was optimistic, notwithstanding embargoes continued to make shipped uncertain, and labor disturbances still handicapped general business activity.

WATERBURY AVERAGE

Lake Copper. Average for 1919, 19.55. 1920—January, 19.25. February, 19.125.—March, 18.875.—April, 19.125.—May, 19.00.—June, 18.50.—July, 19.00.

Brass Mill Zinc. Average for 1919, 8. 1920—January, 9.75. February, 9.40.—March, 9.15.—April, 8.85.—May, 8.30.—June, 8.15.—July, 8.45

JULY MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
Copper:			
Lake	19.00	18.50	18.3333
Electrolytic	19.00	18.12½	18.6071
Casting	18.25	17.75	18.1250
Tin	51.00	48.25	49.3750
Lead	9.25	8.60	8.9279
Zinc (brass special)	8.30	8.00	8.1714
Antimony	7.50	7.25	7.4286
Aluminum	32.50	31.50	32.00
Quicksilver (per flask)	$90.00	$88.00	89.5238
Silver (cts. per oz.) Foreign	95.00	88¾	91.8750

Metal Prices, August 2, 1920

NEW METALS

	Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Electrolytic, carload lots	18½-19
Lake, carload lots	18½-19
Casting, carload lots	18
TIN—Duty Free.	
Straits or Australian, carload lots	48¼
LEAD—Duty Pig, Bars and Old, 25%; pipe and Sheets, 20%. Pig lead, carload lots	8½-9¼
ZINC—Duty 15%.	
Brass Special	8.15
Prime Western, carload lots	8.05
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb., f. o. b. factory	....
Ton lots, f. o. b. factory	32-33
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	7.25
NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%.	
Ingot	43.00
Shot	43.00
Electrolytic	45.00
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.60-$1.85
BISMUTH—Duty free	$2.70-$3.00
CADMIUM—Duty free	$1.40-$1.50
CHROMIUM METAL—Duty free	Nominal
COBALT—97% pure	$2.50-$3.00
QUICKSILVER—Duty 10% per flask of 75 pounds	$88
PLATINUM—Duty free, per ounce	$80-85
SILVER—Government assay—Duty free, per ounce	.99½
GOLD—Duty free, per ounce	$20.67

Metal Prices, August 2, 1920

INGOT METALS

Silicon Copper, 10%	according	to	quantity	49	to55
Silicon Copper, 20%	"	"	"	36	to40
Phosphor Copper, guaranteed 15%	"	"	"	32	to39
Phosphor Copper, guaranteed 10%	"	"	"	31	to38
Manganese Copper, 30%	"	"	"	60	to66
Phosphor Tin, guarantee 5%	"	"	"	60	to65
Phosphor Tin, no guarantee	"	"	"	55	to65
Brass Ingot, Yellow	"	"	"	13½	to15½
Brass Ingot, Red	"	"	"	18	to20½
Bronze Ingot	"	"	"	18½	to21
Parsons Manganese Bronze Ingots	"	"	"	22½	to24
Manganese Bronze Castings	"	"	"	32	to42
Manganese Bronze Ingots	"	"	"	19	to23
Manganese Bronze Forgings	"	"	"	30	to40
Phosphor Bronze	"	"	"	24	to30
Casting Aluminum Alloys	"	"	"	32	to34
Monel Metal	"	"	"	38	to..

OLD METALS

Buying Prices.		Selling Prices.
15 to15½	Heavy Cut Copper	16½to17
14¾to15	Copper Wire	16 to16½
13 to13½	Light Copper	15 to15½
14½to15	Heavy Machine Comp	16½to17
10½to11	Heavy Brass	12½to13
8 to 8½	Light Brass	10 to10½
9 to 9½	No. 1 Yellow Brass Turnings	11 to11½
14 to14½	No. 1 Comp. Turnings	16 to16½
4.25	Heavy Lead	4.90
4.25	Zinc Scrap	5.00
10 to13	Scrap Aluminum Turnings	11 to14
21 to23	Scrap Aluminum, cast alloyed	23.50to25
24.00	Scrap Aluminum, sheet (new)	26.50
36.00	No. 1 Pewter	40.00
18.00	Old Nickel anodes	20.00
26 to28	Old Nickel	30 to32

BRASS MATERIAL—MILL SHIPMENTS

In effect January 7, 1920.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.25¼	$0.27¼	$0.29
Wire	.25¼	.27¼	.29
Rod	.23¾	.28	.30
Brazed tubing	.37	..	.41¼
Open seam tubing	.37	..	.41¾
Angles and channels	.38	..	.42¾

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.26½	$0.28½	$0.30¼
Wire	.26½	.28½	.30¼
Rod	.25	.29¼	.31¼
Brazed tubing	.38¼	..	.43
Open seam tubing	.38¼	..	.43
Angles and channels	.39¼	..	.44

SEAMLESS TUBING

Brass, 30½c. to 32½c. per lb. base.
Copper, 32c. to 34c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	29½c. net base
Muntz or Yellow Metal Sheating (14"x48")	25¾c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	26¾c. " "
Muntz or Yellow Metal Rod	23¾c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	29½c. net base
From stock	33½c-35c net base

BARE COPPER WIRE—CARLOAD LOTS

22¾c. to 23¼c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	31½c. per lb. base
100 lbs. to 300 lbs. in one order	32½c. " " "

ZINC SHEET

Duty, sheet, 15%. Cents per lb

Carload lots, standard sizes and gauges, at mill, 12½c. basis less 8 per cent. discount.

Casks, jobbers' prices	14c.
Open casks, jobbers' prices	14½c

ALUMINUM SHEET AND ROD

Sheet Aluminum, base price, 54c. per lb. Coils 50c. per lb.

ROD.

B. & S. Gauge.

¾" to 1" Advancing by 32nds
1" to 2⅜" " " 16ths } 98% rolled, 43.10 cents per lb
2⅜" to 3½" " " 8ths

⅛" to ¾", 98% rolled and drawn ..... 48.80 cents per lb

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

MONEL METAL

Shot	35
Blocks	35
Sheet Bars	40
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	56
Hot Rolled Sheets (base)	55

Lead Foil—base price—figured on base price of lead at the time.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 96½c. to 99c. per Troy ounce, depending upon quantity.

Rolled sterling silver, 92½c. to 96c.

NICKEL ANODES

85 to 87% purity	.55c. per lb.
90 to 92% "	.57½c. per lb.
95 to 97% "	.60c. per lb.

Supply Prices, August 2, 1920

CHEMICALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.08
Hydrochloric, C. P., 20 deg., Carboys	lb.	.10
Hydrofluoric, 30%	lb.	.50
Nitric, 36 deg. Carboys	100 lb.	8.28
Nitric, 42 deg. Carboys	100 lb.	8.90
Sulphuric, 66 deg., Carboys	lb.	.04½
Alcohol—		
Denatured	gal.	1.50
Alum—		
Lump, Barrels	lb.	.08
Powdered, Barrels	lb.	.09
Aluminum sulphite, commercial tech	lb.	.22
Aluminum chloride solution	lb.	.30
Ammonium—		
Sulphate, tech., Barrels	lb.	.08½
Sulphocyanide	lb.	1.50
Argols, white, see Cream of Tartar	lb.	.80
Arsenic, white, Kegs	lb.	.18
Asphaltum	lb.	.35
Benzol, pure	gal.	.75
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.10½
Calcium Carbonate (Precipitated Chalk)	lb.	.20
Carbon Bisulphide, Drums	lb.	.12
Chrome Green	lb.	—
Cobalt Chloride	lb.	2.00
Copper—		
Acetate	lb.	.60
Carbonate, Barrels	lb.	.29
Cyanide	lb.	.65
Sulphate, Barrels	lb.	.09
Copperas (Iron Sulphate, bbl.)	lb.	.04
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.80
Crocus	lb.	.15
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	6.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.04
Lead Acetate (Sugar of Lead)	lb.	.35
Yellow Oxide (Litharge)	lb.	.25
Mercury Bichloride (Corrosive Sublimate)	lb.	1.95
Nickel—		
Carbonate Dry	lb.	.80
Chloride, 100 lb. lots	lb.	.65
Salts, single, 100 lbs	lb.	.18
Salts, double, bbl	lb.	.15½
Paraffin	lb.	.30
Phosphorus—Duty free, according to quality		40-45
Potash, Caustic, Electrolytic 88-92%, fused	lb.	.32
Electrolytic 70-75%, fused	lb.	.26
Potassium Bichromate, Casks	lb.	.40
Carbonate, 80-85%	lb.	.23
Cyanide, 98-99½%, 100 lb. cases	lb.	—
Pumice, ground, bbls	lb.	.05
Quartz, powdered	ton	—
Official	oz.	—
Rosin, bbls.	lb.	.08½
Rouge, nickel, 100 lb. lots	lb.	.40
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.17
Sal Soda	lb.	—
Silver Chloride, dry	oz.	1.43
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	64¾
Soda Ash, 58%, bbls	lb.	.04
Sodium—		
Biborate, see Borax, bbls	lb.	.10½
Bisulphite, tech. bbls	lb.	.12
Cyanide, 96 to 98%, 100 lbs	lb.	.27
Hydrate (Caustic Soda) bbls	lb.	.08
Hyposulphite, 100 lb. lots	lb.	.06
Nitrate, tech., bags	lb.	.08
Phosphate, tech	lb.	.14
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.80
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.25
Sulphur (Brimstone) bbls	lb.	.04
Tin Chloride	lb.	65
Tripoli Composition	lb.	.02½
Verdigris, see Copper Acetate	lb.	.60
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	1.00
Yellow No. 1	lb.	.60
Whiting	lb.	.10
Zinc, Carbonate, bbls.	lb.	.26
Chloride, 600 lb lots	lb.	.15
Cyanide	lb.	.45
Sulphate, 100 lb. cases	lb.	.05

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	$110.70
14 " 20 " 64/68, "	"	137.60
12 " 20 " 84/92, "	"	143.30
14 " 20 " 84/92, "	"	193.05

Sewed buffs, per pound

Bleached and unbleached	"	1.05

FELT WHEELS

		Price Per Lb.
White Spanish—		
Diameter— 8" to over 16"	Thickness—½" and ¾"	$4.00
" 8"	" 1" to 3"	3.35
" 10" to 16"	" 1" to 3"	3.25
" over 16"	" 1" to 3"	3.35
" 8" to over 16"	" over 3"	3.40
Grey Mexican—		
Diameter— 8" to over 16"	Thickness—½" and ¾"	$3.90
" 8"	" 1" to 3"	3.25
" 10" to 16"	" 1" to 3"	3.15
" over 16"	" 1" to 3"	3.25
" 8" to over 16"	" over 3"	3.30

Above are even diameters. Odd diameters 50c advance.